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WILLIAM HEALEY DALL
1915

The Nautilus.

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THE JAPANESE SPECIES OF BLANFORDIA.

BY HENRY A. PILSBRY.

I have recently received a series of Blanfordias, representing a new species, from Prof. Seitaro Goto of the Zoological Institute of the Science College, Imperial University of Tokyo. Professor Goto writes as follows: "I am interested in these snails as the intermediate hosts of the Japanese blood fluke, whose life-history a former student of mine has succeeded in making out. He has already published a short preliminary paper on the subject and I hope that he may be able to quote your authority in his full paper in regard to the specific identity of the snails. The locality of these specimens is Sakai, Saga Prefecture (Kyushu)."

Blanfordia nosophora (Robson).

The shell is perforate, turrited, solid, of a russet color, the worn summit pink or dark vinaceous. The surface is glossy, faintly marked with growth-striæ. The early whorls are wanting in the adult stage, 5 to 7 whorls remaining. These are strongly convex, united by a deep suture. The last whorl swells out to form a rounded ridge or varix behind the peristome. The aperture is vertical, ovate, somewhat diagonal; deep within it is of a vinaceous color, then yellowish in a band under the varix, finally olive at the edge of the lip. The peristome expands and is narrowly recurved at the edge, and a transparent callus connects the outer and inner margins.

Length 7.2, greatest diam. 3 mm. (old specimen, 5½ whorls remaining).

Length 8.2, greatest diam. 3 mm. (less eroded specimen, 7⅓ whorls remaining).

Length 6.6, greatest diam. 2.6 mm. (younger specimen, 6½ whorls remaining).

This species is related to *Blanfordia japonica* A. Adams, of Sado Island, both having a well-developed varix behind the lip; but the Sado shell has a higher varix, and a much more rapidly tapering spire, the later whorls much wider. A specimen of *B. japonica* 7.3 mm. long is 4.3 mm. in greatest diameter. It is usually larger, about 8 mm. long, after having lost a whorl or two at the tip in the adult stage.

Blanfordia is probably distributed over the whole of the main island of Japan, Sado, Kyushu and southern Yesso. The following species are known to me by many specimens of all of them sent by Mr. Y. Hirase and also from other sources:

a. Outer lip of the shell strengthened by a rounded varix.

b. Shell slender, slowly tapering, the greatest diameter less than half the length. *B. nosophora* (Robson) Kyushu.

bb. Shell stout, conic, the greatest diameter more than half the length. *B. japonica* (A. Ad., 1861) Sado.

aa. Outer lip of shell without any external varix.

b. Larger, the length 8 or 9 mm. *B. bensoni* (A. Ad., 1861) Hokkaido.

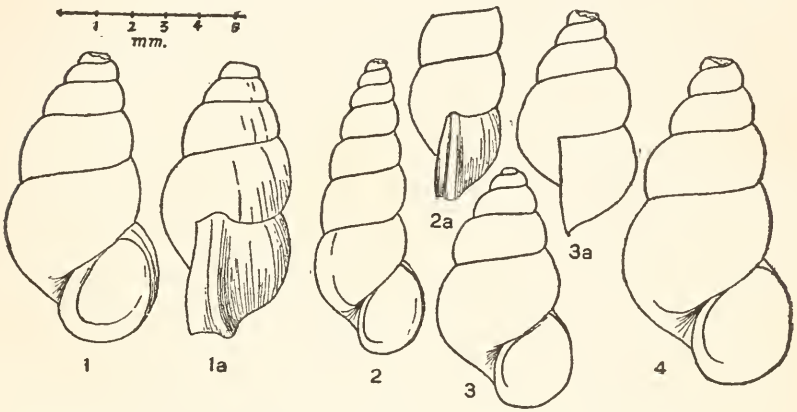
bb. Smaller, the length 6 to 6.5 mm. *B. simplex* Pils., 1902, Uzen, etc.

I have a smaller form than *B. simplex*, with the apex perfect, from Izumo and Omi, but as there are very few specimens, I do not feel sure that it is distinct from *B. simplex;* especially since a snail which seems to be not specifically distinct from *simplex* has been sent by Mr. Y. Hirase from Kajima, Satsuma (his no. 406).

Erosion of the early whorls in fresh-water gastropods seems to be consequent upon extensive parasitization of the liver. It may be that on breaking down of the peripheral (terminal) cells

by the Distomata, etc., shell-material is deposited there, and the filled-up distal end of the shell becomes dead and liable to abrasion by mechanical, chemical or organic external agencies.

Blanfordia has been associated with the *Truncatellidæ* by Fischer and Tryon. The first one I saw was referred to the genus *Pomatiopsis* (*Amnicolidæ*), on account of the dentition, which I described in NAUTILUS for May, 1900, p. 12. Two years later I recognized that my species was a *Blanfordia* (*cf.* Proc. A. N. S. Phila., 1902, pp. 26, 27); and I retained the



FIGS. 1, 1*a*, BLANFORDIA JAPONICA. 2, 2*a*, B. NOSOPHORA.
3, 3*a*, B. SIMPLEX. 4. B. BENSONI.

genus distinct from *Pomatiopsis* because of small differences in the animal as described by Dr. Arthur Adams. The dentition is, however, that of *Pomatiopsis*, which is rather characteristic from the small number of denticles on the two outer teeth—nearly all other *Amnicolidæ* having very numerous denticles on these teeth. My removal of *Blanfordia* from the *Truncatellidæ* and its approximation to *Pomatiopsis* was, I believe, justified.

The type of *Blanfordia* is *B. japonica*. If the genus be thought identical with *Pomatiopsis*, the name may be retained for the varicose species, in a subgeneric sense.

P. S.—Since the above was written, I have received (April 16) a paper "Observations on the Spread of Asiatic Schistosomatosis," by Dr. R. T. Leiper and Surgeon E. K. Atkinson,

R. N., in the *British Medical Journal*, Jan. 30, 1915, dealing with *Schistosoma*, and having as an appendix a note by Mr. G. C. Robson describing the mollusk which serves as host for its cercariæ. This mollusk is called *Katayama nosophora* n. g. et sp. It is undoubtedly identical with the form sent me by Professor Goto, and described above. As I have already had the figures for my article engraved, I allow it to stand as written, merely substituting Mr. Robson's specific name for my own. It may be useful to point out that the mollusk in question belongs to the long-known genus *Blanfordia*, and that the new genus *Katayama* is therefore superfluous. Mr. Robson was naturally misled by the wrong position assigned *Blanfordia* by the older authorities.

SOME EXCEPTIONAL CASES OF BREEDING AMONG THE UNIONIDÆ.[1]

BY ARTHUR D. HOWARD.

In collecting material for the study of a somewhat peculiar case of breeding among the Unionidæ, I have incidentally come upon some other instances, which I believe have not been reported. In 1912 I undertook to work out for the United States Bureau of Fisheries, methods of propagation of the Washboard mussel, *Quadrula heros* Say, with other species of Quadrula. This species was somewhat uncommon in the vicinity of the laboratory where I was stationed, so that there was a question as to a supply of material. One day I noticed a boatload of shells containing an unusual number of *Q. heros* with many young shells. Enquiring of the owner the source of these, I learned they had come from Moline, Ill., some 25 miles above. I subsequently visited the place, finding it accessible and the species sufficiently abundant to furnish considerable data on breeding as well as material for experiments in propagation.

While collecting the Washboard mussel at this point I obtained evidence of peculiarities in the breeding of three other Unionidæ which, although they may not be of immediate im-

[1] Contribution from United States Biological Station, Fairport, Iowa. Published by permission of Commissioner of Fisheries.

portance to the commercial shell buyer, are of undoubted interest to the conchologist. These forms are *Margaritana monodonta* Say, *Hemilastena ambigua* Say, and *Anodonta imbecillis* Say.

Quadrula heros proved to be for this locality a fall breeder, thus an exception to the summer breeding habit of other known Quadrulas. Although the time of breeding is different, the evidence obtained pointed to no change as to tachytictic or short breeding habit characteristic of the Quadrula group. October seemed to be the principal breeding season, as an abundance of gravid mussels was then obtainable. In November, among many specimens examined, no gravid individuals could be found. I have been interested to learn of cases of breeding during later months. These come from localities further south,[1] and apparently are explainable on the basis of climate. There is, however, the possibility of two breeding times in one season, as has been claimed for some other short-period breeders, for example, *Margaritana margaritifera*. I did obtain one breeding in May from many examined, and a similar case is reported by Lefevre and Curtis, who questioned the correctness of placing this form among winter breeders. These cases seem, however, to be very rare and quite exceptional. There is a difference here, worthy of note I believe, in that the time of retention of glochidia in *Q. heros* is relatively short as compared with other winter breeders. I have given other observations upon this mussel and a discussion of the literature in another paper,[2] so need not cite them here.

With the collections of *Q. heros*, *Margaritana monodonta* seemed fairly abundant, so that I saw an opportunity to investigate the breeding of this species. Certain indications pointed to an early spring breeding season, and in one expedition in search of it on March 10th, by reason of the collapse of the ice, I came nearer to its place of abode than I cared to be.

[1] Mr. U. T. Utterbach reports gravid *heros* for January and February, and I desire here to acknowledge his kindness in submitting to me material and notes. For other observations see Howard, A. D., 1914, "Experiments in Propagation of Fresh-water Mussels of the Quadrula Group." Appendix to the report of the U. S. Commissioner on Fisheries for 1913, pp. 1–52, 6 pls.

[2] Howard, A. D., 1914, *op. cit.*, pp. 28, 29.

On May 2nd I succeeded in securing a gravid specimen with eggs and glochidia. All four gills were gravid, the inner containing many more than the outer. Upon removing the mussel from the water I at once placed a portion of the inner and outer gills in preserving fluid. Even with this precaution, the initiation of abortion was evident. The remainder of the mussel, shell and soft parts, I wrapped in cloth, not having a container large enough to fix at once. Upon arrival at the home station I found that complete abortion of the contents of the marsupia had taken place.

Glochidia were present, somewhat immature, but Dnapping, with a number of eggs presumably unfertilized. The glochidia are sub-circular in form, *i. e.*, circular except for the rather short straight hinge line. Harms (1907–1909) figuring the glochidia of *M. margaritifera* presents them somewhat pointed and toothed. I can make out neither of these characters in *M. monodonta.* The dimensions are: Height 0.055–0.065 mm., length 0.055–0.0065 mm., thus being a little larger than those reported for *M. margaritifera* and among the smallest of glochidia. As the ovaries are well distended with eggs near maturity I think there is no doubt that at least two broods are produced in a season, as reported (Conner, Harms and Ortmann) [1] for *M. margaritifera.*

I observed segmentation of ovarian eggs in this species in a specimen which had been cut open and exposed to river water. No data to my knowledge has been obtained relative to the hosts for this species.

Hemilastena ambigua :—Nets placed near the mussel bed, for the purpose of determining the host fishes of *Q. heros* yielded some material that presented quite another problem. With the fishes caught were a number of mud puppies, *Necturus maculosus,* Rafinesque. From a total of fifteen caught twelve or 80 per cent were infected with glochidia of mussels. Upon attempting to identify these a few were found to be *Q. heros* not imbedded, nor becoming so, after an attachment for a known period of twenty-four hours and more. Evidently they were merely ac-

[1] See Ortmann, 1914. Annals Carnegie Museum, vol. 8, no. 2, 1912, p. 232.

cidental infections upon an inappropriate host. The great majority of infections were by a glochidium unknown to me. They were deeply imbedded in the external gills of the Necturus and by keeping the animals alive all winter I succeeded in carrying the young mussels through to the juvenile stage, these being shed the last week in May, soon after which I obtained the young mussels. The parasitic period is a long one from the date the infected salamanders were captured, October 17th to the last of May, being over 7 months. By this test the appropriateness of the host was satisfactorily demonstrated.

These glochidia were different from any in our station collection of which we supposedly had a complete faunal set with one or two exceptions which I knew did not answer the case in question. I looked up all the known Najades which might have a range to the Mississippi River in Eastern Iowa and found that one species was given which we did not have. This was *Hemilastena ambigua*, Say or *Unio hildrethianus*, Lea. An inquiry at the Academy of Sciences, Davenport, Ia., disclosed the fact that there was one record of collection for Davenport.[1]

Lea[2] figures the glochidium of this species but it is so small and so like that of other species that without dimensions a certain identification could not be made from it. As the likelihood of finding material in some collection seemed slight I decided to look for gravid mussels and make a direct comparison. From the literature and such information as could be gathered from experienced collectors, this rare species has the peculiar habit of living under flat stones. This seemed to present a difficulty in collection, for the water was deep at the point where the Necturus had been taken. I had dredged here considerably but no example of this species were in the hauls. Their habitat would seem to account for this failure to secure them as an ordinary boat dredge would be likely to miss them protected as they are by the stone above. The best chance for success seemed to be to locate them in some small stream. In Mr. F.

[1] I am indebted to the Davenport Academy of Sciences for their assistance in this matter and especially to Mr. Paarmann and Miss S. F. Sheldon who kindly looked up the specimen and records.

[2] Lea, Isaac, Observations on the Genus Unio, vol. vi, p. 49, pl. 5, fig. 31.

C. Baker's "Mollusca of the Chicago Area," he cites the collection of this species under such conditions. By correspondence with Mr. Baker I learned the names of the collectors[1] who kindly gave me directions for locating the species which they had taken many years previous. The first five specimens I found were not gravid; so that I feared it was too early or too late. Upon examination with a microscope all proved to be males. Returning to the stream again I found 9 gravid mussels out of a total of 17. The first of these contained glochidia which corresponded exactly with the glochidia found on Necturus in the Mississippi, thus giving me the link I desired to make out the life history.

The glochidia are clear white in color, of the triangular type with well-developed hooks, contrary to the description given by Lea, who however suggested the possibility of hooks in more mature specimens. The dimensions are as follows: Height 0.265 to 0.274 mm., length 0.247 to 0.555 mm.

All of the adult individuals were found under flat stones of the flag-stone type characteristic of the limestone in the region. Beneath a single rock I found four. While exploring the under surface of these I felt and seized a wriggling animal which proved to be a mud-puppy, demonstrating the manner in which Necturus becomes inoculated. Glochidia shed by the mussels in such a location would not have a rapid dispersal by currents so that the Necturus commonly seeking such a shelter would run the chance of a heavy infection. The finding of a mussel parasitic upon a salamander as the appropriate host instead of a fish is the first instance I have known recorded among American mussels. Faussek[2] in St. Petersburg experimented with Amphibia artificially infected with glochidia of Anodontas. He reported successful infection upon *Axolotl* and *Proteus*.

Anodonta imbecillis :—While endeavoring to identify the gloc-

[1] I wish here to acknowledge the kindly assistance and courtesies extended to me by the following gentlemen: Mr. F. C. Baker, Chicago Academy of Sciences; Messrs. J. B. Brown, J. H. Ferriss, J. H. Handwerk and Dr. Alfred Houston, of Joliet, Ill., and Mr. Bryant Walker, of Detroit.

[2] Faussek, 1901. Ueber den parasitismus der Anodonta-Larven. Verhandlungen des V. Internationalen Zoologishen-Congresses (Berlin), pp. 761–766.

hidia which have been described above as parasitic upon Necturus I observed a similarity to the glochidia of *Anodonta imbecillis*, Say. A minute comparison showed differences however and I made an effort to determine if the differences might come within the range of normal variation. To do this I secured as many gravid examples of *A. imbecillis* as I could from the place where the Necturus were captured. In a measurement of glochidia from 16 individuals I found that only the very lowest point of variation in *A. imbecillis* corresponded with the larger of the unknown. It was quite obvious they could not be the same species. While making this examination which yielded negative results to my original search I noted a peculiarity which proved quite a diversion. In measuring the glochidia I came upon individuals which had advanced far beyond the larval stage, having in fact reached a point of development equal to that to be seen in most Unionidae after metamorphosis parasitically upon fishes.

The young mussels, mostly of the same stage, lie crowded in the marsupial gill of the parent without apparently any matrix or conglutinate structure whatever. In this respect we have a condition quite different from that reported by Lefevre and Curtis[1] for the non-parasitic development of *Strophitus edentulus* (Say), in which there is a matrix sub-divided into the so-called cords.

Among the six lots of marsupial juveniles that I collected the degree of development varied slightly as to amount of shell growth, otherwise there seemed to be little difference. This growth consists of a narrow rim only, around the edge of the glochidial shell. The hooks of the glochidium are still much in evidence, but are much weaker than in parasitic forms. A noticeable feature is the large proportion of gaping shells as compared with a similar lot of glochidia. It would seem that with the loss of the powerful single adductor muscle the action of closing is less vigorous. Between the gaping valves can be seen the ciliated foot, two adductor muscles, the mantle, on each side, the gill papillæ, etc.

[1] Lefevre and Curtis. Bull. of the Bureau of Fisheries, vol. xxx, 1910 (issued 1912).

Observations upon the seasons of breeding reveal further peculiarities. Among lots examined in May and November were found individuals carrying in the marsupial gills embryos representing all stages of development except unsegmented eggs. The following counts from two collections will illustrate this:

Locality.	Date.	Stage of Gravidity.					
		Eggs.	Early Embryo.	Late Embryo.	Glochidia.	Juveniles.	Total.
Moline, Ill.....	November 7, 1913.....	....	7	3	7	5	22
Fairport, Ia.....	May 1, 1914	....	2	1	5	6	14

This lack of uniformity in the late fall and early spring counts, it will be seen, does not correspond with the usual conditions to be found in the bradytictic or winter breeders.

In the absence of parasitism this species must lose the usual method of distribution through the migrations of the host fish. What seems to be a compensatory provision for this loss is to be seen in the peculiar light and flattened type of shell of the juvenile, which subjects it to ready transference by water currents. I have described in another paper[1] with fuller discussion the finding of this species in artificial ponds and reservoirs, whither, in the loss of the parasitic habit, they had been carried doubtless by the water supply.

To summarize:

1. *Quadrula heros* as compared with other Quadrulas and members of the Crenodonta group shows a postponement of breeding time from summer to autumn and winter.

2. *Margaritana monodonta* possesses exceptionally small glochidia, and there is evidence of at least two broods in a season.

[1] Howard, A. D., 1914. A Second Case of Metamorphosis without Parasitism in the Unionidæ. Science N. S., vol. xi, no. 1027, pp. 353-355, Sept. 4, 1914.

3. *Hemilastena ambigua* is parasitic in nature upon the amphibian, Necturus maculosus, which in the cases observed became inoculated in the fall, the young mussels being released the last of May.

4. *Anodonta imbecillis* develops without parasitism and gives evidence of broad limits in the range of the breeding season.

THE DALL BANQUET.

A banquet to Dr. William Healey Dall, commemorating the completion of fifty years of service to science, was given by his friends at the Cosmos Club, Washington, on the evening of April 21.

Dr. Charles D. Walcott, Secretary of the Smithsonian Institution, was to preside, but in his absence, due to the death of his father-in-law, Dr. Robert S. Woodward, President of the Carnegie Institution of Washington, took the part of toastmaster with wit and grace.

The Toasts :

Dall the Alaska Pioneer—Dr. Alfred H. Brooks.
Dall the Anthropologist—Prof. Wm. H. Holmes.
Dall the Coast Pilot—Mr. Isaac Winston.
Dall the Malacologist—Dr. Henry A Pilsbry.
Dall the Paleontologist—Dr. T. Wayland Vaughan.
Dall the Zoologist—Dr. C. Hart Merriam.
Dall the Nomenclatorist—Dr. Ch. Wardell Stiles.
Dall the Poet—Justice Wendell P. Stafford.
Dall the Man—General A. W. Greely.
Dr. Dall's response.

Letters from absent friends of Dr. Dall were read by Dr. Whitman Cross, Dr. Frederick A. Lucas, Mr. W. E. Safford and Mr. Paul Brockett.

The speakers were in friendly rivalry to claim Dall for their own special branches of science. Among paleontologists he is acknowledged the great leader in all relating to cenozoic faunas. His "Tertiary Fauna of Florida" is a classic of American paleontology. For years he has been the foremost authority on zoological nomenclature in America. Malacologists almost forget that Dall's work on recent mollusks is only one phase of his many-sided scientific activity, since that alone seems so large an

achievement for one man. We study his works on deep-sea mollusks, on the rich Alaskan and West Coast faunas, the memoirs on land and fresh-water shells of Alaska, of Lower California, the Galapagos, the Mexican boundary, and hundreds of others, and each has the lucidity and easy command of the subject of a specialist in these several departments of conchology.

As an anthropologist, Dall is the author of several important papers, and the editor of standard books. As a geographer and hydrographer, the author of the Alaskan Coast Pilot, his works are in daily practical use.

A portrait of Dr. Dall formed the frontispiece of the beautiful and epigrammatic banquet card. The arrangements of the committee, of which Dr. Paul Bartsch was chairman, were perfect at every point. It was an occasion of delightful goodfellowship.

Participants.—Charles G. Abbott, Vernon Bailey, Frank Baker, Job Barnard, Paul Bartsch, L. A. Bauer, Alexander Graham Bell, Marcus Benjamin, Paul Brockett, Alfred H. Brooks, H. P. Buehler, J. McKeen Cattell, Robert H. Chapman, George H. Clapp, Frank W. Clarke, John M. Clarke, C. Wythe Cooke, F. V. Coville, W. T. Councilman J. C. Crawford, Whitman Cross, Charles Whitney Dall, Charles A. Davis, Henry E. Davis, F. W. De Wolf, J. S. Diller, Edward A. Fay, James H. Ferriss, J. W. Fewkes, James M. Flint, Herbert A. Gill, Charles C. Glover, A. W. Greely, Gilbert H. Grosvenor, Arnold Hague, Oliver P. Hay, Otto Heidemann, John B. Henderson, H. W. Henshaw, Arthur Hollick, William H. Holmes, A. D. Hopkins, George F. Kay, William Bruce King, F. H. Knowlton, E. de K. Leffingwell, A. F. Lucas, Frederic A. Lucas, Marcus W. Lyon, Jr., Wendell C. Mansfield, C. L. Marlatt, Collins Marshall, J. Rush Marshall, William B. Marshall, George C. Martin, George C. Maynard, Edgar A. Mearns, C. Hart Merriam, George P. Merrill, Truman Michelson, J. D. Mitchell, Charles E. Munroe, E. W. Nelson, S. N. D. North, William A. Noyes, Henry Fairfield Osborn, Sidney Paige, Theodore S. Palmer, E. W. Parker, George H. Parker, Francis H. Parsons, Henry A. Pilsbry, Richard Rathbun, Charles W. Richardson, Charles W. Richmond, Robert Ridgway, Henry C. Rizer, Alfred G. Robinson, W. E. Safford, Waldo S. Schmitt, E. A. Schwarz, T. W. Smillie, Erwin F. Smith, George Otis Smith, Hugh M. Smith, J. W. Spencer, Wendell P. Stafford, T. W. Stanton, Leonhard Stejneger, Ch. Wardell Stiles, O. H. Tittmann, A. C. True, E. O. Ulrich, T. Wayland Vaughan, David White, Harvey W. Wiley, Isaac Winston, Robert S. Woodward, Fred. E. Wright.

THE NAUTILUS.

VOL. XXIX. JUNE, 1915. No. 2

THE NEW MEXICAN EXPEDITION OF 1914—ASHMUNELLA.

BY H. A. PILSBRY AND JAS. H. FERRISS.

Few shells have been collected in the Mogollon range, in the western part of Socorro County, New Mexico, prior to the reconnaissance made by one of us and Mr. L. E. Daniels. The only *Ashmunella* known from there was *A. mogollonensis* Pils., collected by Prof. E. O. Wooton in 1900. In the limited time spent there last summer only a few canyons on the southwestern slope were explored, so that this paper, and those on the other genera to follow, may be regarded as a mere sketch of the snail fauna, to be filled out by further field-work. The localities mentioned may be found on the Mogollon Quadrangle of the U. S. Geological Survey Topographic Map, a rough tracing of which is given in Fig. 1, with the positions of collecting stations indicated by their serial numbers.

The affinities of the snails seem to be with the Chiricahuan fauna. The species of *Ashmunella* are different, but they have an unmistakable Chiricahuan appearance. This leads us to believe that they were evolved from the same ancestral species, which must have been in Pliocene times able to migrate over a great area now destitute of snails.

The gorges in the canyons of the south-west side of the Mogollon mountains were so narrow that the talus ran down to the edges of the stream, well shaded by the cliffs and the trees. Conditions were much alike with the different colonies except

in the item of shade, and in Dry Creek it was but a stone's throw from one colony to another for two or three miles. The small stone-fields with sufficient depth contained the most living examples, perhaps because these contained the shortest routes to the outside feeding grounds. Where the trees had

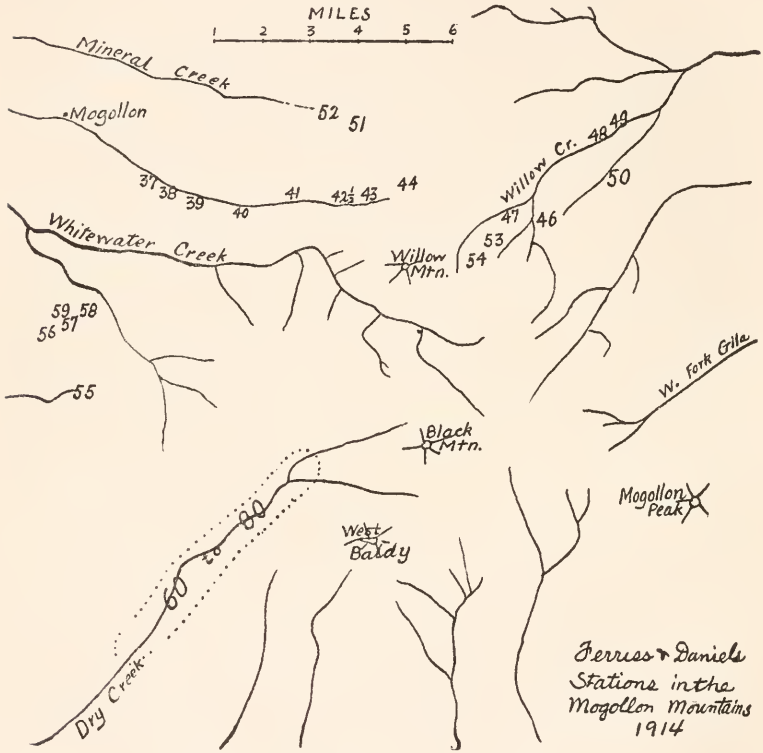


Fig. 1. Tracing reduced one-half from U. S. G. S. Topographic Map, Mogollon Quadrangle, edit. of June, 1912, showing locations of snail colonies, numbered 37 to 80.

fallen and let in the sun dead shells were numerous. In one thickly inhabited slide, no living specimens remained.

If one of the moulds or a mouse or a chipmunk family moves in, there is trouble in snaildom. Otherwise, with a well-drained rock pile, not too deep nor too shallow, a little leaf mould and

the shade of a gooseberry, an elderberry or a rose, there is snail happiness. Perhaps the small gnawers like some snails better for dinner than others, but it has not been proven. For weeks of collecting there may be no broken shells, but the next day, another range or canyon, dead and broken shells will be the rule. Very few broken *Oreohelix* were found in the summer of 1914, but in 1913 the same species of *Oreohelix* met with terrible slaughter from the gnawers; some colonies were entirely destroyed. A group of Sonorellas equipped with an offensive odor seem to be well protected. Of the thousands turned up in 1913 not more than half a dozen had been broken, and these were probably mistakes made by meat-eaters lacking in the knowledge of conchology.

ASHMUNELLA TETRODON n. sp. Plate 1, figs. 1, 2.

The shell is umbilicate, width of umbilicus contained nearly six times in the diameter of the shell; depressed, angular in front, the angle situated above the middle, and nearly or quite disappearing on the last third of the last whorl; spire and base convex; thin, cinnamon or cinnamon-brown above, fading on the base. The surface has a silky luster, and is very weakly marked with growth-lines; on the base some excessively weak spiral lines may be seen under strong magnification. There are $5\frac{1}{2}$ convex, closely-coiled whorls, the last descending a little in front, having a deep, narrow constriction or gutter behind the peristome; behind this gutter it is rather swollen and distinctly striate. The umbilicus is cylindric within, and enlarges at the last whorl. The aperture is very oblique; peristome white or pinkish, reflexed throughout, with a recurved edge, the face rounded. Outer margin bears a long, very slightly retracted, flat-topped or slightly notched tooth. Basal margin is armed with two marginal teeth, the outer one slightly larger. These two teeth are somewhat compressed laterally, and are yoked together by a callus on the edge of the broad lip. The spaces between the three teeth are about equal. The transparent parietal callous bears an obliquely radial tooth, set rather far in, and in old examples having the inner end slightly curved towards the basal lip. The outer end often has a low callus outwardly and sometimes one running in.

Young shells form a quite thin lip-callus at resting stages, but these seem to be absorbed subsequently, as no opaque streaks are visible in the adult stage.

Height 6.7, diam. 15 mm.

Locality.—A mile or two above the box of Dry Creek Canyon, Station 70, south slope of the Mogollon Mts. (4 miles south of the Little Whitewater station); elevation from 6000 to 7500 feet. Also at various stations mentioned below, in the same canyon.

Explanation of Plates.

Note.—Figures on plate I, and figs. 1–3 on plate II, are $1\frac{2}{3}$ natural size; figures 4–8 on plate II are natural size.

Plate I. Fig. 1. Ashmunella tetrodon. Type and paratypes. Station 72.

Fig. 2. Ashmunella tetrodon. Station 79.

Figs. 3, 3a. Ashmunella tetrodon. Variety with small parietal tooth. Station 60.

Fig. 4. Ashmunella tetrodon mutator. Station 60.

Fig. 5. Ashmunella tetrodon mutator. Type and paratypes. Station 80.

Fig. 6. Ashmunella tetrodon mutator. Station 67.

Fig. 7. Ashmunella tetrodon inermis. Type and paratypes. Station 69.

Plate II. Fig. 1. Ashmunella danielsi. Type and paratypes. Station 57.

Fig. 2. Ashmunella danielsi dispar. Type and paratypes. Station 55.

Fig. 3. Ashmunella pilsbryana Ferriss.

Fig. 4. Sonorella peninsularis Pils. Type. Lower California.

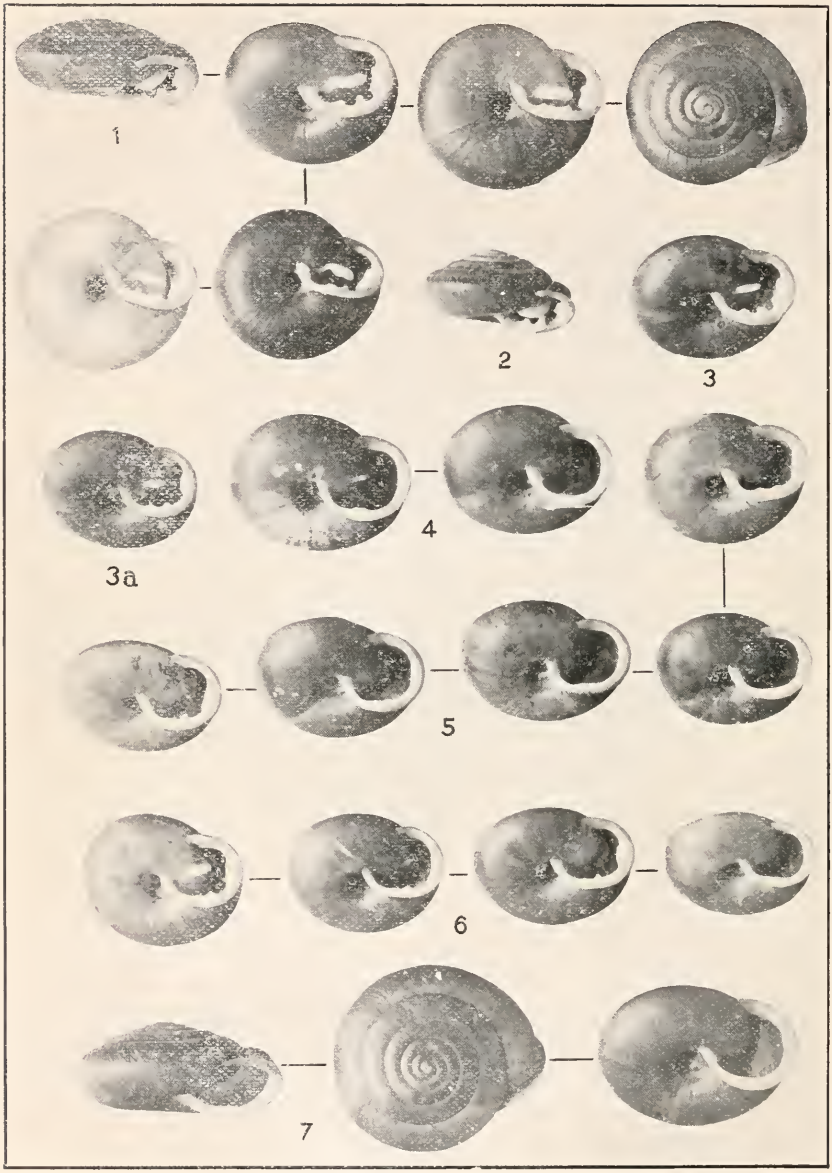
Fig. 5. Sonorella ultima Pils. Type. Sinaloa.

Fig. 6. Epiphragmophora ellipsostoma Pils. Type. Lower California (?).

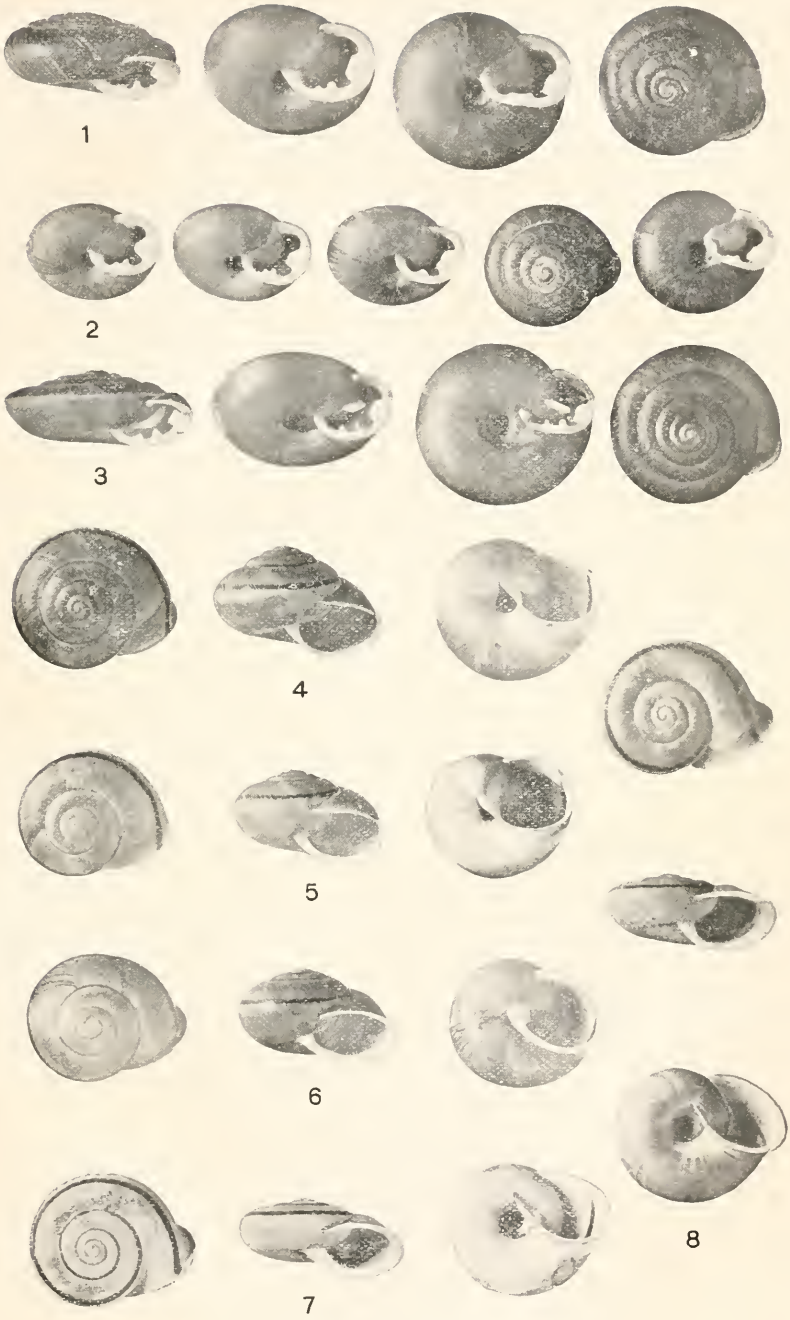
Fig. 7. Sonorella lioderma Pils. Type. Lower California.

Fig. 8. Sonorella lohrii (Gabb). Type. Lower California.

(*To be continued*)



1-3a. ASHMUNELLA TETRODON PILS. & FERR.
4-6. ASHMUNELLA TETRODON MUTATOR P. & F.
7. ASHMUNELLA TETRODON INERMIS P. & F.



1. ASHMUNELLA DANIELSI PILS. & FERR.
2. ASHMUNELLA DANIELSI DISPAR P. & F.
3. ASHMUNELLA PILSBRYI FERRISS.
4-8. SONORELLA OF LOWER CALIFORNIA.

THE SIERRA DE CUBITAS, CAMAGUEY, CUBA.

BY JOHN B. HENDERSON.

Modern railway extension in Cuba has opened many new fields of exploration in that delightful island which were denied to the past generation of collectors. This is especially the case in the central provinces of Santa Clara and Camaguey. In northern Camaguey there is an east and west range of hills known as the Sierra de Cubitas which raise their limestone crests about six or seven hundred feet above the level plains of the province. Like all limestone elevations in Cuba these present a forested region of great variety and richness which in this instance contrasts strongly with the almost treeless prairies that surround them.

The first mollusk record from the Cubitas was made by Carlos de la Torre who gathered there a few shells some ten years ago. Stillman Berry traversed one of the passes of the range about two years ago and took a few specimens en route. These he generously divided with me and at the first glance I then and there decided to take the very first opportunity to visit the region. All his shells were new. In December last, Mrs. A. C. Reed of Camaguey, an American who takes a great interest in Cuban land shells, spent a day collecting at the Loma de Borje, an outlaying isolated hill of the Cubitas system, and her catch was remarkable in the number of new operculates and long slender Microceramus belonging to quite a new group. Save for two species (*Macroceramus hendersoni* Torre and *Microceramus longa* Hend.) none of the novelties obtained here have been published.

In February last the looked-for opportunity arrived, and Charles T. Simpson, Carlos de la Torre and I proceeded to Camaguey, where we outfited for an assault upon the hills. Four days were spent in an almost frenzied siege upon the mollusks along a ten or twelve mile front, and I believe we have overlooked very little. We made little or no effort to collect the larger tree snails of wider distribution, but persisted in our search for the special things that are confined to this range. The two particular and striking elements are the development of a series of operculates that cannot very definitely be placed

in any genus unless in Dr. Dall's *Opisthosiphon*, although even there they fit only by virtue of having a siphon back of the aperture, but otherwise do not resemble nor have much in common with the *Ctenopomas* that form the bulk of Dall's genus; and secondly, the remarkable development of large *Macroceramus* of the *M. hendersoni* group and of long, slender *Urocoptis*-like *Microceramus*. Like the operculates these all appear to be new in species and groups.

The absence of all *Urocoptids* (save the one *U. camagueyana* Torre) is striking. None of the other shells that do seem referable to published species are typical except the *Pleurodonte* and *Liguus*, which are widely distributed over the island, and signify but little in questions of local distribution.

The strangeness of this mollusk group which appears to be removed from the Oriente and Trinidad groups gives rise to some perplexing queries in distribution. There seems to be a sort of vague line of connection with northern Santa Clara and diagonally south across the island and including the Isle of Pines. This is hinted at by a few species rather than proclaimed by the total. We have still much to learn about Cuban land shells.

What we had anticipated would be a very hard trip turned out to be one of our easiest ones. The open, level country made travel in a volanta-like trap possible and the few natives living in this sparsely settled country are hospitable to the point of embarrassment. We slept in our own hammocks and strangely enough our only discomfort was occasioned by the cold nights. We nearly froze to death.

SHELLS OF PUT-IN-BAY ISLAND, LAKE ERIE.

BY JOHN A. ALLEN.

Put-in-Bay is a beautiful island in Lake Erie, nearly all cultivated with orchard and vineyard, but retaining some rocky forest. It is of limestone formation, contains caves, and at places is faced with cliffs, and in the wilder parts is adorned with brilliant flowers, scarlet Silene and blue Pentstemon .

The island is about three miles from the Ohio shore, is about

three and a half miles long and about one and a half miles across at the broadest place. It is divided into two unequal parts by an isthmus. Nearly the whole breadth of this isthmus is occupied by a pool, which until lately was bordered on one side by a little patch of woods.

Here are found:

Polygyra albolabris (Say), a reddish form characteristic of marshy woods on the Lake Erie islands; *Polygyra multilineata* (Say); *Polygyra monodon* (Rack.).

Vallonia pulchella (Müll.); *Vallonia excentrica* Sterki; *Vallonia parvula* Sterki.

Bifidaria armifera (Say); *Bifidaria contracta* (Say); *Bifidaria pentodon* (Say); *Bifidaria holzingeri* Sterki.

Vitrea hammonis (Ström); *Vitrea indentata* (Say).

Zonitoides arborea (Say); *Zonitoides minuscula* (Binn.).

Agriolimax campestris (Binn.)

Succinea retusa Lea var. *higginsi* Bland.

In 1914 a monument to Commodore Perry was set up at one corner of the pool, and incidentally this interesting shell station was ruined. It was doubtless the type locality of *Succinea retusa higginsi* Bland. However, the same *Succinea* was found, though less copiously, beside a little bay west of the village.

Still farther west a considerable piece of dry, rocky woods extends along the shore, and contains:

Polygyra albolabris (Say), ordinary light-colored form; *Polygyra zaleta* (Binn.); *Polygyra thyroidus* (Say); *Polygyra profunda* (Say); *Polygyra fraudulenta* Pils.; *Polygyra inflecta* (Say).

Philomycus carolinensis (Bosc.).

Pyramidula solitaria (Say).

Succinea ovalis Say?

(This *Succinea*, of which only fragmentary dead shells were seen, and also the two slugs enumerated, are given from memory.)

Elsewhere on Put-in-Bay Island were found:

Pyramidula cronkhitei anthonyi Pils.

Helicodiscus parallelus (Say).

Carychium exiguum (Say).

While *Pyramidula alternata* (Say) is generally distributed.

A single shell of *Lymnaea dalli* (Baker) was found in a meadow just east of the isthmus, clinging like a land shell to the under side of a piece of wood. The pool of the isthmus has been ruined for shell life by the application of oil, and probably no fresh-water shells now inhabit any enclosed water on Put-in-Bay Island.

Kelley's Island, about five miles southeast of Put-in-Bay, was partially explored. It yielded:

Polygyra albolabris (Say), ordinary light-colored form; *Polygyra albolabris* (Say), reddish form in marshy woods. *Polygyra zaleta* (Binn.); *Polygyra thyroidus* (Say); *Polygyra profunda* (Say); *Polygyra fraudulenta* Pils.; *Polygyra inflecta* (Say); *Polygyra multilineata* (Say); *Polygyra monodon* (Rack.).

Vallonia pulchella (Müll.).

Bifidaria armifera (Say); *Bifidaria contructa* (Say); *Bifidaria holzingeri* Sterki.

Zonitoides arborea (Say).

Pyramidula solitaria (Say); *Pyramidula alternata* (Say).

Helicodiscus parallelus (Say).

Succinea avara Say; *Succinea retusa* Lea.

ON THE CLASSIFICATION OF THE LYMNÆIDS.

BY FRANK C. BAKER.

Recently several interesting contributions have appeared which contain valuable data bearing on the classification of the family *Lymnæidæ*. These treat somewhat critically of the previous classifications which have been attempted. Roszkowski[1] presents a handsomely illustrated paper full of data on the structural and biological aspects of the Lymnæas of Lac Léman. This lake has already provided material for the pens of several distinguished malacologists; among them Forel and Brot. Roszkowski's researches add greatly to what we already know concerning the deep-water and littoral fauna of this interesting lake.

[1] Contribution à l'étude des Limnées du Lac Léman. Revue Suisse de Zoologie, xxii, No. 15, July, 1914, pages 457–539, plates 14–17.

In the first part of this paper (anatomical and systematic) the author describes the anatomy, radula and genitalia of *Lymnæa stagnalis*, *Radix auricularia* and *ovata*, and *Galba palustris*. It is apparent that there is great variability in the radula of many of the species of Lymnæids. In the paper in question, *auricularia* is described and figured with both bicuspid and tricuspid laterals, the first lateral being invariably tricuspid. In the individuals of the American form (introduced) which have been examined, the first lateral was always tricuspid, but the balance were bicuspid or with a small entoconic swelling. *Palustris* in Roszkowski's paper has both bicuspid and tricuspid laterals, while in the American form examined the laterals have in all cases been bicuspid. This is true also of *reflexa*, *emarginata*, *catascopium* and others of this group. As remarked elsewhere, the writer has not been able to observe a normal central tooth of Lymnæa which was other than unicuspid, though several pathological examples have been seen in which there were one or more side cusps. Very high powers have been used and great care has been exercised in making examinations.

In order to verify the form of teeth of American Lymnaeas published by the writer, several species, among them *palustris*, *reflexa*, *mighelsi*, *danielsi*, *stagnalis*, *auricularia*, *obrussa*, and *columella*, were reexamined, and no deviation from the published figures was observed. All of the lateral teeth of the palustris group were bicuspid. *Stagnalis* has a slight endoconic swelling which might be taken for a typical cusp. If the difference pointed out by Roszkowski for both *stagnalis* and *palustris* would prove stable there might be grounds for separating the European and American species, in which cases the latter species would become *appressa* Say and *nuttalliana* Lea. In *auricularia* the lateral teeth vary as shown by Roszkowski (plate 16, figs. 183-186) being, according to this author normally tricuspid though sometimes with the first lateral tricuspid and the balance bicuspid, as figured by the present writer. Upon reexamination, the laterals of the Lincoln Park specimens were found to be as figured by the writer and by Roszkowski on plate 16 figure 183.

Additional comparative studies are needed in which many individual radulae are observed to ascertain the amount of var-

iation and whether this variation increases with wear and age. Biometric studies upon hundreds of radulae would be of great service. A variable radula renders tooth formulas of little value as has been stated by Roszkowski. In the American species examined this variability has been of such small percentage as to cause little or no difficulty in placing species in their appropriate groups.

The genitalia seem to provide characters of greater stability than do the radulae. The genitalia of the European and American species agree in all essential details and it seems true that these organs offer characters sufficiently stable for the separation of groups of species as has already been done in the writer's monograph of this family. Some years ago the opinion was expressed in a letter to Roszkowski, that the short, pyriform receptaclum seminis without long canal which is found in *ovata* Drap and *profunda* Clessin would seem to provide a character of group importance (see Roszkowski, plate 17, figs. 196-197). The length of the epiphallus allies these species with *auricularia* in the genus *Radix*. The writer hesitates to add another name to this already overburdened family, and simply suggests that this character may be found of value in a future classification should it occur in other species. This form of receptaculum seminis has not been observed in any American species of Lymnaea. Roszkowski's paper is a valuable contribution to our knowledge of the Lymnaeas and similar studies on other species (American as well as European) would greatly aid in providing reliable data for a satisfactory classification of this family. We wish that some American post-graduate student would elect such a theme for his doctorate dissertation.

In a recent paper,[1] Mr. Harold S. Colton publishes some valuable suggestions on the classification of the Lymnæids. While the writer would not for a moment claim that he has said the last word on the classification of this family, he does not believe that anything would be gained by a return to the old use of the name *Lymnæa*. While the differences proposed for the separation of the names admitted to generic rank in the

[1] Nautilus XXVIII, pages 116–120, Feb., 1915.

writer's monograph are slight, they have thus far proven reasonably stable. In any classification it must be the sum-total of characters that provide diagnostic features of value, and even if these be small they are sufficient if they include certain groups to the exclusion of others. No single character, as the radula or the genitalia, will prove satisfactory. A case in point is *Radix*, in which the lateral teeth of the radula are now known to be either bi- or tricuspid. As the writer stated in his monograph diagnostic features must be based on the sum of the characters presented by the shell, radula, genitalia, or other organs. Colton says "our present knowledge will not allow us to make a comprehensive classification of the Lymnaeids based on the anatomy of the snail." This result cannot be attained by recasting the data now available, but rather by the addition of new data on old species or on species now unknown anatomically.

The writer can by no means agree with the statement made twice in this paper that generic names should not be added unless based on undebatable grounds because of the inconvenience to the cataloger. If this criticism should be recognized we would revert to the use of many of the older names in the Pulmonata as well as in the Naiades. It is recognized, of course, that generic subdivision can be overdone, but in the advancement of science the convenience of the cataloger or teacher is not considered. Generic or other divisional names are simply for the purpose of bringing together groups of similar organisms which we designate as genera, subgenera or sections. In some cases the criteria for the separation of these genera will be of a distinct and decided character; while in others, where there are many species of similar characteristics, these distinctions will necessarily be founded on data of a less decided character. Such a condition obtains in the family under discussion and whatever the criteria used for the separation of genera or other groups, they can apparently be of only quantitative character. The relative value of these criteria will vary with the importance ascribed to them by different authors.

We welcome all additions to knowledge and we know full well that the work of yesterday is rendered obsolete by the work of to-morrow, but the writer cannot see how the reduction to

subgenera and sections of the names used as genera and subgenera in the monograph in question advances our knowledge of the family any more than the raising of a number of subgenera and sections to generic rank, as Colton believes the writer to have done in his monograph. This rather resembles a game of see-saw!

The provisional key of Colton (page 119) is good, and the writer would also be interested to know how useful it may prove to the workers in this family. We would suggest that there is a vast fund of useful information to be acquired from a biometric study of both the radula and the genitalia of the Lymnaeas. If we knew the range and the relative amount of variation of these organs we could more intelligently use these criteria for purposes of classification. An abundance of time is needed for this work but the results would compensate for the time expended. The studies which have thus far been made upon this family serve to emphasize the one fact which stands out clearly, the great variability of the shells and organs of the fresh-water pulmonates, a condition in strong contrast with the terrestrial pulmonata where the radulæ and genitalia are much more stable in character and hence more satisfactory for purposes of classification.

PUBLICATIONS RECEIVED.

An Index to the Museum Boltenianum. By Wm. H. Dall. Smithsonian Institution Publication No. 2360. The republication of Bolten's work by Messrs. Sherborn and Sykes (1906) made it accessible to conchologists generally, but its use has been difficult on account of the absence of any index to the great number of names, combined with the unfamiliar nomenclature, which often made even well-known Linnæan species hard to find. Dr. Dall has very appreciably lightened this labor by a full and cross-referenced index. It is prefaced by a historical account of the work, a discussion of its nomenclature, and translations of the Latin Preface and the German Introductions. The Institution desires to give the widest usefulness to this Index, and will supply copies to all who may be interested.—H. A. P.

The Nautilus.

Vol. XXIX. JULY, 1915. No. 3

VITREA CRYPTOMPHALA N. SP., WITH NOTES ON THE INDENTATA GROUP.

BY GEORGE H. CLAPP.

Vitrea cryptomphala n. sp. Fig. 1.

Shell thin, polished, very light horn-color to white, generally white, translucent; whorls 5 to 5½, those of the spire regularly increasing, the last widening very rapidly and doubling the diameter of the shell. Aperture broadly lunate, sutures well impressed, all whorls showing through the shell. Surface sculptured with rather evenly spaced, radiating grooves continued to the base as in *V. indentata* and *carolinensis*, there being from 23 to 34 on the body whorl. Micro-sculpture of even, close, clear-cut spiral engraved lines like those of *carolinensis*, best seen with a magnification of 25 diameters or over. Spire much depressed, almost flat, the termination of the last whorl slightly raised at the lip which is straight on the lower edge and well curved forward above, projecting about 1 mm. beyond the lower lip; at the columellar end the lip is thickened and joined to a *tongue-like callus which completely covers the umbilicus at all stages of growth.* There is a thin, microscopically granular parietal callus, as in *V. indentata.* Base of shell well rounded and less impressed in the umbilical region than *indentata* or *carolinensis.*

Shell figured (Knox Co.,) 5.1x4.2x2.1mm., whorls 5, 23 grooves on body whorl.

Largest, Knox Co., 5.7x4.8x2.7mm., whorls 5, 26 grooves on body whorl.

Largest, Knoxville, 5.9x5.0x2.8mm., whorls 5, 34 grooves on body whorl.

Smallest, Knox Co., 2.1x1.9x1.1mm., whorls 3, umbilicus completely covered.

The largest shell seen is from "along Coosa River, 2 miles N. of Wetumpka, Ala.," it is 8.0x6.8x3.3mm. whorls $5\frac{1}{2}$, 28 grooves on body whorl.

FIG. 1.—VITREA CRYPTOMPHALA.

Types from a lot of over 400 shells collected by the late Mrs. George Andrews and labeled "Knox Co., Tenn." A lot of 18 shells in her cabinet series are labeled "Knoxville, Tenn.": they all probably came from near Knoxville, perhaps from a favorite "hunting ground" of hers, "The Cliffs" on the south side of the river. Type No. 7365 of my collection. Cotypes in Acad. Nat. Sci. Phila. (No. 112421), U. S. Nat. Mus., and collection of Dr. Bryant Walker.

At first I was inclined to consider this a variety of *V. carolinensis*, but the flatter spire, the umbilicus covered *at all stages of growth*, the less excavated umbilical region and the wider aperture indicate a good species. I examined 250 *V. indentata* from 41 localities and 110 *carolinensis* and *var. wetherbyi* from 15 localities and found no intermediates.

In addition to the Knox Co. shells I have *cryptomphala* from 14 localities in Alabama, San Antonio, Tex., McComb City, Miss., Fayetteville, Tenn., and Albion, Ill., nearly 600 shells in all. A sectioned shell shows the thickening of the columella, caused by the callus, clear to the apex.

In the box with the Knox Co. *cryptomphala* were over 70 shells which from the sculpture should be *V. carolinensis wetherbyi*, but if they were found in the North would be called *indentata*, and a single example of *V. rhoadsi*. I am indebted to Mr. Walker for the suggestion of the very appropriate name.

Some notes on *Vitrea indentata* (Say) and allies may be given here.

In the Journ. Acad., 11, 372 (1822) Say described *Helix indentata* as imperforate, stating: "umbilicus none, but the umbilical region is deeply indented". Pilsbry, in The Nautilus, xii, p. 102, shows that this was an error :—"In Say's types the perforation may be seen with a good lens, though it was not noticed by Say, who probably worked with what would now be thought an inferior glass".

The Texas form of *indentata* is generally larger than the typical eastern form and was at one time identified by W. G. Binney as *sculptilis* Bld. In the British Naturalist, April 1893, p. 81, Cockerell speaks of the Texas form as "*Z. indentatus* var. *umbilicatus* Singley" (See also Nautilus, xii, p. 120). This variety has a *very distinct* umbilicus.

"*Zonites carolinensis*" Ckll., is very inadequately described in Binney's Supplement iv, p. 167, pl. III, fig. 7, and it will be noticed that the figure shows a distinct perforation. In the Nautilus, xii, p. 120, Cockerell gives his "original description", although I have been unable to find it in any other place. In this he says : "Umbilicus small, narrow".

In Proc. Acad. Nat. Sci., 1900, p. 130, Pilsbry describes the microsculpture of *carolinensis* as a character which separates it from *indentata* and calls all of the Great Smoky shells *carolinensis*. In a review of this paper, "Mollusca of the Great Smoky Mountains", published in the Nautilus, vol. xiv, p. 45, Cockerell says : "Thus in place of *Vitrea indentata* there is an abundance of *V. carolinensis* of a small type (var. *wetherbyi* Ckll. ined.) intermediate between *indentata* and *carolinensis* proper, the exact locality of which is unfortunately unknown". This is the only "description" of var. *wetherbyi* that I have been able to find, except that in Proc. A. N. S., 1902, p. 430, "The Mollusca of the Mt. Mitchell Region, No. Car.," Pilsbry says : "The type

specimens (*V. carolinensis*) have 5 whorls with a maximum diameter of 10 mm". Under *V. carolinensis wetherbyi* Ckll., he says :—"In the report of the expedition of 1899 the specimens of *V. carolinensis* were found to belong to a small race, ranging from 5½ to 7 mm. in diameter. Cockerell has since distinguished it under the above varietal name". . . . "It is intermediate between typical *V. carolinensis* and *V. indentata.*" From this it would seem that shells from say 7½ mm. up to 10 mm. diameter are *carolinensis* and under 7 mm. diameter are var. *wetherbyi*, and as there is nothing said to the contrary it is safe to assume that the variety is umbilicate.

Under the above differentiation by size the only *carolinensis* in my collection are 5 specimens collected by the late Mrs. Geo. Andrews at Cranberry, Avery Co., N. C.; they are narrowly umbilicate. All of the balance are either "Var. *wetherbyi*" or the new species described above.

Cockerell says that *carolinensis* has about 26 grooved lines on the body whorl, my three largest Cranberry shells have 38, 34 and 32 respectively, while a 6½ mm. diameter shell from Mitchell Co., N. C., (labeled *carolinensis* by A. G. Wetherby) has 35 and a 6¼ mm. shell from Paint Rock, N. C. has 32 lines.

THE NATIVE OYSTERS OF OYSTER RIVER, DURHAM, N. H.

BY C. H. BATCHELDER.

A natural bed of native oysters has persisted in Oyster river, Durham, New Hampshire, ever since the settlement of the town in 1635. This persistence of the oysters is interesting in view of the fact that they have been fished almost constantly. A superficial survey of the beds reveals the following very general information.

The beds are found in from six to fifteen feet of water at low tide, in the channel of the stream, which varies from five to about twenty yards in width, and the bed extends along this channel for a half mile, in such quantities that one can rake a bushel easily in less than an hour. I am confident however, that the bed extends into deeper water for half a mile beyond

this. Wild oysters are also found on ledges and boulders at the half-tide mark along the entire river bank for a distance of two miles. A few of these fail to survive the exposure in winter but where Fucus fronds cover them completely and they are not molested they often grow to six inches in length. In these situations they are subjected to protracted low temperatures during the winter months and a short season for the growth of the "spat". The water temperature in the month of September drops to the vicinity of 15° C. by the 30th. In the middle of October the temperature is down to 12° C. and by the middle of November down to 8° C. The density of the water varies between 1.015 and 1.0225. The "spat" first appeared, or perhaps more correctly, were first discovered on the twelfth of October. At this time they were about 6.5 mm. in diameter. On November 23 they were again measured and were about 11.5 mm. Notes and specimens taken at this time were only for idle curiosity and are not absolutely reliable.

The only enemies beside man that I know of are the boring sponge and *Urosalpinx cinerea*. Inquiry and repeated examination have failed to discover the presence of the starfish or any of the commensal crabs and I believe they fail to ascend the river as far as the Durham beds. The beds are entirely self-propagating. No attention is ever paid to the need of the "spat"; and clean shells or stones for their attachment have never been placed in the river. I have never heard of the oysters having been taken for commercial purposes, but many are gathered for "home consumption".

THE NEW MEXICAN EXPEDITION OF 1914—ASHMUNELLA.

BY H. A. PILSBRY AND JAS. H. FERRISS.

[*Continued from p.* 16.]

ASHMUNELLA TETRODON P. & F.

In the type lot the diameter varies from 12.8 mm. with 5¼ whorls to 15 mm. with 5½ whorls. This is the usual range of variation in size. In stations 75 and 71 all are rather small, in the former from 12 to 14 mm.—mostly about 13 mm., and at

71 from 11.3 to 13 mm. The smallest have barely 5 whorls. Probably some local condition dwarfs all the individuals in these stations.

In several stations, 70, 71, 72, 73, there are very beautiful albino specimens of a transparent marguerite-yellow tint among the dark ones. See first two figures within second row, representing an albino and one of the darkest examples, from station 72.

Compared with *A. proxima* Pils. of the Chiricahua range, this species differs as follows : It is less depressed. The peripheral angle becomes weak and then nearly or quite disappears at the last part of the whorl where it is more swollen above. There is a furrow behind the lip up to the suture, and the *upper lip is reflexed*, while in *A. proxima* the upper lip is straight, not expanded, and there is a whitish triangular patch and no gutter above the end of the outer lip. *A. proxima* has one more whorl. The aperture is larger in *A. tetrodon* when specimens of the same diameter are compared. *A. tetrodon* is less depressed and less angular than *A. pilsbryi*, which further differs by its papillose surface.

All of these colonies in the box of Dry Creek Canyon were found in company with *Oreohelix barbata* Pils. The colonies farther up the stream had also *A. mogollonensis* for company.

In color and teeth, *A. tetrodon* is much the same as the Cave Spring *A. danielsi*, with the addition in this of a parietal lamella.

Dry Creek is dry at the crossing of the Silver City and Mogollon road. Six miles above it becomes a large and beautiful trout stream, boxed in for two miles so closely and roughly that the banks are not used for grazing purposes, and are never disturbed. Twenty snail colonies were found in the rock slides during a hasty search of these, two or three more miles above. Above the box shells were found in the grass and weeds also. In nearly every instance the colonies differed in size and in the character of the teeth. Some had no teeth (var. *inermis*); others, as with *A. heterodon* Pils., of the Huachucas, ran from no teeth to four, with all the variations between (var. *mutator*).

In the colony at Station 60 there are some individuals differing from typical *tetrodon* by having the parietal tooth reduced

(pl. 1, figs. 3, 3a). These are partly transitional to var. *mutator*.

The following two are named as sub-species in order that we may have a convenient means of referring to them. They intergrade, but their modification has been as great as that usually distinguishing species of *Helicidæ*.

ASHMUNELLA TETRODON MUTATOR n. subsp. Pl. 1, figs. 3 to 6.

In color, shape and sculpture this subspecies is like *A. tetrodon*. As in that species, the upper lip is well reflected from the insertion out; former resting stages are often marked by an opaque light streak on the base. In the typical colony there is no parietal tooth and the lip-teeth are much reduced; there are vestiges of the long tooth within the outer margin, and of the two teeth of the basal margin, but in many individuals of the typical colony these vestiges are exceedingly weak, hardly noticeable. There are about $5\frac{1}{3}$ whorls.

Height 6.25, diam. 14 mm.
Height 6.9, diam. 13.8 mm. } Station 60.
Height 6, diam. 12.5 mm.

Height 7, diam. 14 mm., whorls $5\frac{1}{3}$ } Station 61.
Height 8, diam. 15 mm., whorls $5\frac{2}{3}$

Locality.—Station 80 (1914), in Dry Creek Canyon, Socorro Co., N. M. Also Stations 60, 61, 62, 68, in the same canyon. 6,000–7,000 feet elevation.

This is very abundant in some places, where large series of fresh "bones" were taken, but living ones were rare. It is one of those lawless species, such as we have described from the Huachucas—a species which has been caught in the act of losing its teeth. Its affinities are clearly with *A. tetrodon* of the same canyon, and there seems to be no decided break between the most fully toothed *mutator* and the *tetrodon* with smallest teeth.

The specimen described as type of *mutator* is from a colony in which no specimens have a parietal tooth. Varying forms from this colony (Station 80) are represented in Fig. 5, all being perfectly adult shells. Similar are those from Stations 61, 62, 68.

In the lot from Station 60 all the shells are rather distinctly

striate. The most fully toothed example (pl. 1, figs. 3, 3a) agree with *A. tetrodon*, except that the parietal tooth is smaller. There are other examples, with all of the teeth smaller than in *tetrodon*, and still others, found with them (No. 60 A) have the lip-teeth very small, partly wanting, the parietal tooth either wanting or minute (pl. 1, figs. 4). This is the only instance where almost fully toothed *tetrodon* and *mutator* occur in the same colony ; but without transitional individuals.

Lots from Stations 67 (pl. 1, figs. 6, four *adult* shells) and 78 vary from shells having four small teeth (like the *tetrodon* from Station 60) to shells having only weak rudiments of teeth. The lots from these stations therefore connect *tetrodon* and *mutator*, and cause us to rank the latter as a variety of the former. The varying condition of the teeth in different colonies may be briefly indicated in a few, to give an idea of this variation.

Station 78. In nineteen examples, 10 were toothless ; 2 had a full set of teeth and a lamella ; 3 had a lamella and thickened in both lip positions ; 1 had a lamella only ; 4 had three "pimples" upon the lip in place of teeth, no lamella ; 1 had a "pimple" at the basal position. Diameter 12 to 14.5 mm.

Station 61. Eight had a full set of teeth and lamella ; 13 had teeth upon the lip in different degrees of development. 1 had a lamella only, 6 were toothless. Diameter 13.4 to 15.2 mm.

Station 62. In 75 shells 12 had a lamella and a full set of teeth, varying from mere "pimples" to fully developed teeth, 28 had a full set of teeth on the lip only, also varying as much in development, 19 with one or two basal teeth, only 12 without teeth. Nearly all were dead or broken shells. Diameter 14.6 to 11.4 mm.

Station 67. Coarser growth-lines and striations more distinct ; not guttered deeply back of the lip ; angulation more pronounced, umbilicus enlarged in the last half of last whorl. Spire more elevated than the two preceding colonies. Diameter 12½ to 14 mm.

In a lot of 125 (dead and broken) 34 had a lamella and the full set of teeth, 54 had three teeth upon the lip, 6 had a basal tooth only, and 11 were toothless.

Station 68. Same as the preceding, but smaller and smoother. Nine were collected alive. These measured 7 mm. in alt. and

12.6 in diameter. Two or three were toothless, the other had 3 teeth upon the lip.

ASHMUNELLA TETRODON INERMIS n. subsp. Pl. 1, fig. 7.

Larger than the other forms, biconvex, indistinctly angular above the middle in front, the periphery becoming rounded on the last third of a whorl. There are $5\frac{1}{2}$ to 6 convex, closely-coiled whorls, the last descending a little in front, guttered behind the lip, swollen behind the gutter. Surface lightly marked with growth-lines, without spiral striæ. The aperture has no teeth, or in some specimens shows extremely weak traces of them. The lip is reflexed, the edge recurved, but it is very narrow.

Height 8, diam. 17.5 mm.

Height 7.3, diam. 15 mm.

Locality.—Station 69, Dry Creek. Also Station 63, where it is rare.

This is a smaller and especially more depressed shell than *A. mogollonensis*, differing, moreover, by the noticeable peripheral angle in front and the absence of spiral incised lines. While it seems at first rather absurd to connect this form with *A. tetrodon*, yet except by its greater size it does not differ in any important respect from the least toothed of the variety *mutator*. We regard it as a final stage in the degeneration of teeth, like *Ashmunella esuritor* in the Chiricahuas.

At first glance it seems to be without teeth, but it carries a suggestion of teeth in the slight thickening of the lip in the outer margin and a mere pimple at the basal position. Two in twenty-four had two "pimples" at the basal position. Seven had none. One with a "pimple" also had the mere suggestion of a parietal lamella. Parietal callus thin and colorless. One or two varix-streaks in every specimen, usually at or near the end of the penultimate whorl.

This colony and the next seem farthest removed from the typical *tetrodon*. At this station also were found a few of the full-toothed form of *tetrodon*, but without transitional specimens.

Station 63. Growth-lines deeper than in Station 69. Shell more depressed, larger. Three in six had the suggestion of a basal tooth.

Two largest—Height 8, diam. 19 mm.
Height 8½, diam. 16.5 mm.
Two smallest—Height 7, diam. 16.4 mm.
Height 8, diam. 15.6 mm.

ASHMUNELLA DANIELSI n. sp. Pl. 2, figs. 1.

The shell is similar to *A. tetrodon* in shape, luster and color; but it differs in the following characters. The fine spiral lines, when the surface is perfectly preserved, are numerous and distinct. *There is never any trace of a parietal tooth.* The two teeth of the basal margin are closer together, and the inner one is much smaller than the outer, the umbilicus is a trifle smaller. Finally, the callous rim strengthening the lip of the young, in resting stages, is not absorbed, but remains visible as an internal varix, producing an opaque streak in the adult, visible externally on the base, or if the surface is dulled, it may be seen by holding the shell up to the light.

Height 7, diam. 14.5 mm.; 5½ whorls.

Height 7, diam. 13.3 mm.; 5½ whorls.

Locality.—Cave Spring Canyon (near the south fork of Whitewater Creek, Range 19 West on the parallel of 33° 20′, U. S. G. S. Topographic Map, Mogollon Quadangle). Socorro Co., New Mexico.

This species is remarkable for retaining large lip-teeth while the parietal tooth has totally disappeared, showing that these teeth are not connected in inheritance, though from the diminution of all together in *A. t. mutator* a connection would be supposed to exist. The large series taken at stations 57, 58, 59 show very little variation. As in *A. tetrodon*, the basal teeth are yoked together, by a callus resembling the letter U.

About seventy of these were collected in the lower station (56) of Cave Spring Canyon, a large number broken by the mice. Elevation about 7,000 feet. This canyon is about two miles north, running parallel with the Little Whitewater. No other large shells were found there.

Station 57. About two miles farther up the canyon on large slides, one-half mile below Kitt's new mine and cabin, were *Ashmunellas* in unlimited numbers, in company with *Oreohelix*

barbata Pils. A stiff shower during the night brought them out upon the rocks, and with sycamore shade in plenty they remained active during the following forenoon. The teeth upon the lower margin were smaller than at Station 56, lip more rounded, but no other difference of importance was noted. Compared with the former station, one example measured 7.4 mm. alt., 15 diam. Smaller examples were found than in the former colony. Two of these measured, alt. 6.2, diam. 13.5 mm.; alt. 6.4, diam. 13.4 mm.

Sections 58, 59. Above the cabin. in a branch of the canyon north of east, and in the rocks around and above Cave Spring, were found shells smaller in diameter but otherwise unchanged. Three of this colony measured:

Height 6.6, diam. 13.6 mm.

Height 6.8, diam. 12.6 mm.

Height 6.8, diam. 12.4 mm.

These stations were at an altitude above 8,000 feet, the high point of the range. The upper two miles of this canyon was left unexplored.

(*To be continued.*)

NOTES

Mr. Frank C. Baker announces that he has resigned his position as Curator and Acting Director of the Chicago Academy of Sciences. His address for the summer will be 1555 Highland Avenue, Rochester, N. Y.

Viviparus malleatus Reeve in Massachusetts:—In April, 1914, Mr. William J. Clench brought in two specimens of the above species for determination, collected in Muddy River, a small stream dividing Boston from Brookline. Shortly afterwards a third specimen was found by Mr. Kendall Foster. At the time I was inclined to consider it a recent introduction from some aquarium, as the animals were dead when found and probably killed by the cold, being unable to stand the winter. On Nov. 2, 1914 a fourth specimen was found by Mr. P. S. Remington. On April 1, of this year four specimens were again

found by Mr. Foster, the largest measuring 47 mm., the smallest 11 mm., the other specimens found showing all gradations in size between these two. The length of time between the finding of the first and last specimens and the presence of both young and adult, would indicate that the species is probably established. They may have been introduced when goldfish were placed in the stream, which, I have been told, was done to destroy mosquito larvae. In THE NAUTILUS, vol. 25, p. 31, 1911, Mr. Harold Hannibal records this species in California.

C. W. JOHNSON.

CAMPELOMA LEWISII WALKER IN ILLINOIS.—This characteristic *Campeloma* extends into Illinois, as suggested by Dr. Walker.[1] Specimens are in the collection of the Chicago Academy of Sciences from Cache Creek, Pulaski County and Clear Creek, Union County. These conform closely to the published figure (Nautilus, plate v, fig. 3). As Dr. Walker remarks, they are much thinner than *subsolidum* and the whorls are not as convex. Union and Pulaski counties are in the extreme southern part of the state and probably mark the northern limit of the range of this species. The specimens were collected by Dr. Howard N. Lyon, a Chicago physician, who has long been interested in the study of the Mollusca.—FRANK C. BAKER.

A banquet was given for Mr. James H. Ferriss by his friends in Joliet, on the occasion of his retirement from newspaper activity as editor of the Joliet Daily News. Incidents of the struggle for good government and social betterment of Joliet were recounted in the toasts by business men, professional men and clergymen of Joliet, most of whom had been associated with the editor of the *News* at one time or another during the thirty-eight years of Ferriss's control of that newspaper. The high ideals of the editor of the *News* and their influence on the civic development of Joliet were alluded to. Mr. E. E. Hand of Chicago spoke of Mr. Ferriss's attainments as a conchologist. His scientific tastes were further recognized by the gift of a microscope, the presentation speech being made by Professor Willard N. Clute, the well-known writer on ferns.

[1] Nautilus, XXVIII, page 127.

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APICAL CHARACTERS IN SOMATOGYRUS, WITH DESCRIPTIONS OF THREE NEW SPECIES.

BY BRYANT WALKER

In his description of *Somatogyrus walkerianus*, (NAUT., xviii, p. 140), Aldrich stated that "the nucleus is obliquely placed and projects markedly beyond the outline of the spire on the left side." This is the only observation that has been published with reference to any special apical characters in this genus.

Recently, while studying several lots of *Somatogyrus* collected by Messrs. Hinkley and Wheeler in Arkansas, I noticed, while examining an uneroded specimen with an ordinary glass, that not only was the apical whorl decidedly everted, but that it was apparently punctate. On putting it under a compound lens the spirally punctate sculpture was clearly developed. This led to a careful study of all of the described species with some very interesting results.

The irregular coiling of the apical whorl, or partial eversion, as it were, is very common in *Somatogyrus* and is found, to a greater or less extent in all of the species in which the spire is more or less conically elevated and acute. In species having the apical whorls flattened, of which *S. strengii* is a conspicuous example, no eversion is found.

The amount of apical eversion varies not only in the different species, but also in individuals of the same species. But when

it does occur in any species, it is, apparently, always present to some degree. As a specific character, therefore, the presence or absence of eversion can be relied upon, but the amount of eversion, when present, would seem to be an individual, rather than a racial or specific peculiarity.

The amount of eversion is usually coincident with the height and acuteness of the spire. In species having a comparatively high, acute spire, the apical whorls are more closely coiled and the apical whorl, itself, is very convex and separated from the succeeding whorl by a deep, constrictive suture. In species with a blunter apex the apical whorl is less convex, being well rounded above, but less constricted below by the suture. In all of these forms, the apex itself, when viewed laterally, is not acutely pointed. It is more or less obliquely flattened on top and the tip, or what would be the tip if it were everted, is below the level of the surrounding whorl and often is, as it were, immersed in the axis.

In species with flat or planorboid apices, there is no eversion of the apical whorl, which is not constricted by the suture, but is flatly rounded above and separated from the succeeding whorl by a well defined, but vertical suture.

In nearly all of the species that have been examined, there is a well defined apical sculpture. In *Somatogyrus*, apparently, the embryonic shell has only a single whorl and the apical sculpture, when present, is confined to that whorl. It is wholly epidermal in character. The epidermis being very thin and delicate, it is extremely subject to erosion and frequently has entirely disappeared in specimens, which, so far as the shape of the whorl is concerned, are substantially uneroded. For this reason, in several of the described species none of the specimens on hand were sufficiently perfect to afford any information as to their apical sculpture and in others the apices of all of the specimens were entirely eroded.

The apical sculpture, when present, is exceedingly fine and delicate and, even in perfect specimens, usually requires a lens of 100 diameters to develop it fully. It is, apparently, quite constant in its character in each species and, when different in detail, would seem to be a good specific character.

The apical sculpture begins with the earliest formation of the shell covering and, so far as I have observed, does not extend beyond the embryonic portion. Usually, at first, it consists of irregular wrinkles, which are, often, quite regularly transverse in position. After about the first half of the apical whorl, these develop into small punctations and become regularly spiral in arrangement. In some species these spiral lines of punctations extend back to the very tip of the shell. In the next stage of development, these rows of spiral pits become fused into a continuous, more or less, perfect groove and the divisions between them become fine, spiral liræ. The tendency to become lirate is stronger on the lower part of the apical whorl and, perhaps, the most usual form of sculpture is punctate-lirate above and lirate below. But not unfrequently the lirate sculpture covers the whole of the last half of the whorl.

With the exception of the species with a planorbiform apex, I have not been able, as yet, to discover any sufficient differences in the apical characters that would serve to differentiate the characteristic species of the Alabama drainage, having a flattened, very heavily calloused columella, from those of the Ohio system with a relatively thin, rounded columellar lip.

In the following species I have not been able to ascertain the apical characters on account of the eroded condition of all of the specimens on hand: *S. aldrichi*, *biangulatus*, *constrictus*, *crassus*, *pumilus*, *pygmæus*, *tennesseensis* and *umbilicatus*.

The following notes give briefly the results of my examination of the rest of the described species:

S. amnicoloides Walker. Apex blunt, flatly rounded. Apical whorl scarcely at all everted, not constricted by the suture, which is well impressed, but vertical. Sculpture practically obsolete under 100 diameters.

S. aureus Tryon. Apex prominent. Apical whorl everted, sometimes very much so, convex, constricted by a deep suture, which varies as the whorl is more or less everted. Sculptured, at first, with strong, irregular wrinkles, then regularly, spirally punctate, becoming obsoletely lirate on the second half of the whorl. The tendency to liration is stronger on the lower part of the whorl towards the suture.

S. coosaensis Walker. Quite different from any other species. Apex not prominent nor much elevated. Apical whorl flatly rounded, very rapidly enlarging, scarcely everted, not constricted by the suture, which is deep, but vertical. Apical tip not turned down, but up. Sculpture, wrinkled and punctate above, lirate below.

S. crassilabris Walker. Apex subelevated. Apical whorl rounded, constricted by a rather deep suture, everted and obliquely flattened above. Sculpture, strongly and regularly spirally punctate above from the tip, lirate below.

S. currierianus Lea. Apex rather prominent. Apical whorl rather low, nearly flat above, convexly rounded, but not constricted by the suture and not everted. Sculpture, spirally punctate-lirate above, lirate below.

S. decipiens Walker. Apical whorl very slightly everted, obliquely flattened above, low, not constricted by the suture. Sculpture, wrinkled at first, then spirally punctate above, lirate below.

S. depressus Tryon. Apex rather blunt, but higher and more rounded than in *integer*. Apical whorl slightly everted, obliquely flattened above, but not constricted by the suture. Sculpture, punctate or malleated, more decidedly than in *integer;* no trace of liræ.

S. excavatus Walker. Only a single specimen sufficiently perfect to show any trace of the sculpture. In this, the erosion is not sufficient to destroy the shape of the apical whorl, but the sculpture is very indistinct. Apparently, it is irregularly, transversely wrinkled, but no distinct punctations are visible. The apical whorl is flatly rounded above, but not constricted by the suture. The apical tip is not immersed, but projects above the surrounding whorl.

S. georgianus Walker. Apical whorl prominent, elevated, not much constricted by the suture, much everted and obliquely flattened above. The second whorl is shouldered. Sculpture spirally punctate.

S. hendersoni Walker. No specimens with perfect apices. Apical whorl much elevated, though variable in this particular, more or less everted, usually much so, and constricted by the

suture. Sculpture, evidently irregularly punctate, no signs of liræ.

S. hinkleyi Walker. Apical whorls more or less elevated, bluntly rounded. Apical whorl flatly rounded, not constricted by the suture, apex immersed. Sculpture, very finely and irregularly punctate above and more or less lirate below.

S. humerosus Walker. Apical whorl much elevated, everted, rounded and constricted by the suture. Sculpture, punctate above and lirate below.

S. integer Say. Apical whorl not everted, flatter than in *subglobosus*. Sculpture, scarcely more than wrinkled, no liræ.

S. mexicanus Pilsbry. Apical whorls elevated, rather pyramidal, more so than in any other species, closely coiled, rather acutely pointed. Apical whorl only slightly everted, not constricted by the suture. Sculpture, closely, finely and irregularly punctate, no liræ.

(*To be continued.*)

THE NEW MEXICAN EXPEDITION OF 1914—ASHMUNELLA.

BY H. A. PILSBRY AND JAS. H. FERRISS.

(*Concluded from page* 35).

ASHMUNELLA DANIELSI DISPAR n. subsp. Pl. 2, fig. 2.

Smaller than *A. danielsi*, composed of 5 whorls, and like that in having no trace of a parietal tooth. The long tooth in the outer lip is strongly developed. The two basal teeth are *nearer together*, and *more or less completely united* or sometimes fused into one. The umbilicus enlarges very little at the last whorl.

Height 5.8, diam. 11.2 mm.

Smallest adult, diam. 9.8, largest 11.25 mm.

Locality.—Station 55 (1914), Little Whitewater Canyon, Mogollon Mountains.

One of the smallest *Ashmunellas*. It runs parallel to *A. duplicidens* of the Chiricahua range in structure of the basal teeth.

One hundred examples were collected. No other shells were found at this station except a few of the smaller families.

The locality is at an elevation of about 7,500 feet, six miles east of Glenwood, Socorro Co., N. M. The canyon was explored only to Kitt's mining cabin.

ASHMUNELLA PILSBRYANA Ferriss. Pl. 2, figs. 3.

Ashmunella pilsbryana Ferriss, Nautilus Vol. 27, p. 109 (1914).

Distinguished from other species of this region by its acutely angular periphery and granulose surface.

Ashmunella pilsbryana has not been taken in the Mogollon range, but in the region westward. It has been found only in a small territory along the San Francisco river, and in company with no other large shell except *Sonorella*. A mile or so back in the hills from the Harper ranch, and four miles above Clifton, Arizona, a few dead shells were found in the rock slides. The removal of timber had apparently killed the snails. Only a couple of living *Sonorellas* were found here in half a day, but no living Ashmunellas.

Two miles above the mouth of the Blue river colonies of *A. pilsbryana* and a small *Sonorella* were found in a thrifty condition, and a couple of smaller colonies were located in between this station and the Harper ranch. All of these are within some twenty miles of river front. These colonies were in shaded talus that ran down to the flood plain. *A. pilsbryana* will probably be found farther up the San Francisco river, but none were found in the vicinity of Alma, New Mexico. The rock in that stretch of river may have held mineral qualities distasteful to all snails.

ASHMUNELLA MOGOLLONENSIS Pils.

This fine species is rather widely spread in the Mogollons. It was found in 24 colonies in Silver Creek canyon, in the village along the Bursam road (a trail running east from Mogollon across the crest of the range) to Willow Creek, and again in Big Dry Creek Canyon. The latter were large and bright-colored, distinctly striated with incised spiral lines on all but the embryo whorls. One measures 10.8 mm. alt. by 22 mm. diameter.

Shells from the colonies upon Silver and Willow Creeks varied much in size, though some colonies had large and small. The

smallest on these streams was 7.6 mm. alt. by 15 diameter; the largest was 20 mm. in diameter. One colony had fine albinos.

MIGRATION OF ILYANASSA OBSOLETA, LITORINA LITOREA AND LITORINA RUDIS.

BY C. H. BATCHELDER.

The migration of a species is an important event in the history of a brackish water stream. It marks at once, the departure of somebody's food and the passing of *somebody else's* enemy; it means that the biological relations of the remaining species will be upset and that readjustment must take place. With the passing of an enemy, a species that has lived in seclusion prospers, multiplies and assumes other abodes previously inacessible. In new situations new foods become available,—and so things change. The snails of a brackish-water stream are as subject to annual migrations as the other inhabitants and some of them are extremely interesting to observe. Migrations of *Nassa obsoleta, L. litorea and L. rudis* were observed on Oyster river, Durham, N. H. in 1914–15 and the following is an account of the movements.

The most notable molluscan migrations that I have observed are the annual movements of *Ilyanassa obsoleta*. During late spring, summer and early fall it inhabits the mud flats exposed at low-tide. This environment becomes impossible, however, during the colder months when ground-ice may form and this forces the snail to migrate to the deeper waters for the winter.

Migration of Ilyanassa downstream was first observed on the 18th of October in 1914 and it had probably proceeded then during five or six days. Migration continued during the next two weeks but the greater number of healthier individuals moved down-stream in the week ending October 25. The rate of their movement appeared to depend somewhat on the temperature but no measurements were taken in support of this. The healthy individuals moved out into the deep water of the channel to depths varying from ten to fifteen feet at low tide.

This meant a journey of from five to fifty yards and some of them may have gone farther. After deep water is reached the operculum is not drawn entirely over the foot but just sufficiently so to permit the gray, wrinkled flesh to protrude all around the operculum and just level with the aperture of the shell. This is the condition of hibernation for the winter. This was evidenced by examination of all stations in February 1915 when the dormant condition was found to be characteristic even for the older and weaker individuals who had completely lost their opercula. Some of the feebler individuals were unable to reach the deeper water and stopped where the water always runs in a swift current. Here, they bedded in pockets to the number of several hundreds. A few were discovered in the mud-flat channel where there is an inch of water at the lowest tides but these always present the appearance of extreme old age.

Migration of Ilyanassa upstream began on either April 6th or 7th and continued during the following two weeks, the more vigorous of the migrants proceeding upstream in the interval between April 8 and 15. Showers fell during the 5th and 6th which warmed the water and reduced its density. Crawling steadily they reached their summer habitat in four days. At this time their distribution on low-tide flats was very characteristic. A dozen snails picked up at random would include smaller, older and more eroded individuals than would be the case if the lot had come from the channel. Evidently, these snails were the last to migrate in the fall. They were followed by a larger lot with spires worn very little, opercula unbroken and with a more brilliant cuticle. These spread out over the flats and intermingled with the cripples already in possession. This difference in the general average was quite perceptible in the first stages of the migration but was soon obliterated. An economic distribution of the species is probably never accomplished and adjustment is probably not attained before the summer. Even in summer Ilyanassa roves about a great deal on the mud flats and they may always be found in the channels in small numbers.

The migrating Ilyanassa are very interesting to watch. At

times the channel bottom is purple with the migrating snails. Each one will be seen to be poking his siphon out an inch ahead of him testing the water to the right and to the left and always moving along with a characteristic persistency. He only stops where the current has swept everything else away and then only until the tide favors him again. I have seen, him crawling along where the crabs were hanging on to the sea weeds for dear life, and even while stopped for a while one sees him still testing the water ahead of him. He eats his lunch on the march, troubles himself not at all about his shelter for the night but ploughs his way along even though the water in his path be fresh, opaque with sediment or a briny salt pool. It matters nothing to him : over the obstacles in his path he crawls, reaches the channel bank and then seeks out a new environment in the water below or if it be in spring on the mud flats above.

One more interesting habit of Ilyanassa and we shall be done with him. He is not always submarine in his habits. While traveling over the surface he must have water running over him. He stops wherever the tide uncovers him. When the tide comes in again it may find him perched on a rock. This approach of the water may loosen his hold and he may tip backward curling in his foot as he tumbles. Many times he simply rolls over and is submerged ; but as often the current catches him and bears him along upside down with his inturned foot preserving the buoyancy of the mass. I have seen dozens floating along in just this manner, but whether it is an accident or purposeful activity, I have been unable to find out. Sometimes he steals a ride on the back of his neighbor, or on a floating weed or stick and quite often on the shell of *L. litorea*.

Litorina litorea migrates with Ilyanassa but is far less active. They move very slowly, rest frequently and often explore the rocks and ledges that line the channel. They follow Ilyanassa down stream in the fall part way, winter with them in the shallower, ice-free basins and return with them in the spring. During the winter *L. litorea* may be found clinging fast to the rocks in the channel bed or may go no farther than the lowest of the shore bowlders where they hibernate with *L. rudis* under the Fucus hovers. They migrate at most 25 or 30 feet.

Litorina rudis and *L. pulliata* are two other inhabitants of the brackish waters which must migrate annually to escape the ground ice of winter. These forms inhabit the Fucus fronds and rocks along the shore between tides. They do not leave these situations until driven out by the cold. Hence, they do not leave their stations until the middle of November and then move very slowly down over the Fucus and rocks to some point below the level of ice formation. In February they are most frequently discovered beneath the lowest living fronds of Fucus which hang down over the lowest line of exposed bowlders forming a hover for the snails. They may also be found packed into the crevices between the rocks and under the over-hanging ledges. The larger snails apparently lead an active life during the severest winter weather, for I have found them still feeding at 12° C. I have also discovered them in active copulation in every month of the winter. The younger individuals are less fortunate in their migration. Apparently they become exhausted and crawl beneath the stones of the upper tide limits where they hibernate during the winter months. They are the first of the snails to appear, however, coming forth this year during the week of March 1st. Active migration of the larger snail did not begin until the fourteenth of the month and the upper limits were reached on the twenty-first of March. The migration continued for some time later though less perceptibly and less actively.

I have not observed any one cause for the migration of these snails except temperature. The Ilyanassa offers a perplexing problem indeed. If it isn't absolutely necessary, why do they go into very deep water? They leave the flats and return when the water at low tide is at or near 13.5° C. *L. litorea* apparently wanders about until by pure accident he stumbles onto a place favorable for hibernation. *L. rudis* and *palliata* migrated most actively when the temperature of the water at high tide was 11.5° C. Density changes in the water were so slight that they cannot be held responsible for the migrations. A shortage of food material may be important; but the causes, whatever they are, seem complex enough for a special study of the subject.

MOLLUSKS FROM BERRIEN COUNTY, MICHIGAN.

BY FRANK C. BAKER.

Some time ago a day was spent in the virgin woods known as the Warren Woods, situated near Three Oaks. The woodland borders the Galien River and is in the southwestern part of Berrien County, only a few miles from Lake Michigan. The forest is untouched by man and is a veritable paradise for the botanist and nature-lover. It is probable that systematic search would greatly increase the number of species listed, which were gathered while engaged in general nature work. The Sphaeriidae were identified by Dr. V. Sterki.

Pisidium scutellatum Sterki. Galien River.

Sphærium occidentale amphibium St. Galien River.

Symphynota costata (Raf.). Galien River.

Pomatiopsis lapidaria (Say). Galien River.

Pomatiopsis cincinnatiensis (Lea). Galien River.

Physa gyrina Say. Small stream flowing into Galien River.

Physa walkeri Crandall. Small stream flowing into Galien River.

Galba parva (Lea). Small stream flowing into Galien River.

Galba humilis modicella (Say). Small stream flowing into Galien River.

Succinea ovalis Say. Warren Woods.

Succinea avara Say. Warren Woods.

Succinea retusa Lea. Warren Woods.

Pyramidula alternata (Say). Warren Woods.

Pyramidula perspectiva (Say). Warren Woods.

Pyramidula cronkhitei anthonyi Pilsbry. Warren Woods.

Agriolimax campestris (Say). Warren Woods.

Zonitoides nitida (Muller). Warren Woods.

Vitrea hammonis (Strom). Warren Woods.

Circinaria concava (Say). Warren Woods.

Polygyra albolabris (Say). Warren Woods.

Polygyra thyroides (Say). Warren Woods.

Polygyra palliata (Say). Warren Woods.

Polygyra fraudulenta (Say). Warren Woods.

Polygyra tridentata (Say). Warren Woods.

A NEW SUBSPECIES OF OREOHELIX COOPERI.

BY HENRY A. PILSBRY.

Mr. S. S. Berry has recently sent me specimens of a pygmy race of *O. cooperi*, which he found on July 4th, in the snowy mountains, Fergus Co., Montana, at an elevation of somewhat over 5000 feet. "The dead shells" he writes, "were abundant among loose rocks on the mountain slope forming the east wall of Swimming Woman Creek canyon, about half a mile above the mouth, and I found no spot free of them in the area searched, either at the foot of the slope or higher up. The living ones were harder to find because not only less abundant, but distinctly harder to see. Over the entire slope, all the shells were remarkably uniform in size, those sent you being an average lot. I noted that the young lenticular shells are ornamented more or less conspicuously with epidermal projections and fringes, some being quite hirsute."

OREOHELIX COOPERI BERRYI, n. subsp.

The shell has the shape characteristic of *O. cooperi* except that the last whorl is distinctly angular in front, the angle disappearing on the last half or third, leaving the periphery rounded. Color cinnamon to snuff brown, from the third whorl on profusely marked with white patches and narrow streaks; last whorl having a chocolate band below the periphery (frequently also a narrower or paler band in the middle of the upper surface, and several dilute brownish bands on the base, interrupting the white markings). The surface is irregularly striate and shows traces of spiral striation in places. Whorls $4\frac{1}{3}$, all convex: embryonic shell of nearly two whorls, which are finely striate and covered with very fine spirals, the last half of the second whorl having more distinct spiral striæ. Umbilicus narrow, contained $5\frac{1}{2}$ times in the diameter of shell.

Alt. 6.3, diam. 9.4 mm. (type, No. 112489 A. N. S. P.).

Alt. 6.1, diam. 9.3 mm. (paratype, coll. S. S. Berry).

In some examples the striæ are distinctly granose in spiral series on the base. This shell is much smaller and less depressed than *O. cooperi minor* Ckll. *O. alpina* Elrod is more depressed with a wider umbilicus.

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APICAL CHARACTERS IN SOMATOGYRUS, WITH DESCRIPTIONS OF THREE NEW SPECIES.

BY BRYANT WALKER

(*Continued from page 41*)

S. nanus Walker. Apical whorl prominent, blunt, flatly rounded, only slightly everted, not constricted by the suture, very rapidly enlarging, a peculiarity apparently confined to a few species. Sculpture punctate above and lirate below.

S. obtusus Walker. Apical whorl obtuse, flatly rounded, not everted, not constricted by the suture, which is well impressed, but vertical. Sculpture, very delicately wrinkled, in some scarcely visible under 100 diameters, practically smooth, no liræ.

S. parvulus Tryon. Apical whorl prominent, decidedly everted and obliquely flattened above. Sculpture, strongly punctate-lirate, the liræ extending well up on the whorl.

S. pennsylvanicus Walker. Apical whorl rather small, elevated, very much everted and obliquely flattened above, well rounded and constricted by the suture. Apex immersed. Sculpture, strongly spirally punctate on the first half of the apical whorl, running into punctate liræ on the second half, lirate below.

S. pilsbryanus Walker. Quite variable in the elevation of the apical whorl, which may be prominent, everted, and obliquely flattened above, rounded and constricted by the suture below or blunt, scarcely everted and less constricted by the suture. Sculpture, spirally punctate above, obsoletely lirate below.

S. quadratus Walker. Only a single example shows any trace of the sculpture, which though eroded above, is distinctly lirate below. Apical whorl not everted, rounded and shouldered above, not constricted by the suture.

S. sargenti Pilsbry. Variable as to the elevation of the apical whorl, (which is usually rather blunt) ; some amount of eversion and constriction by the suture. Sculpture, distinctly spirally punctate above, lirate below.

S. strengii P. and W. This species is remarkable free from erosion, probably on account of the depressed apical whorls, which are planorboid, flattened above, with a well impressed vertical suture. Apical whorl flatly rounded, not everted, quite rapidly increasing. Apex somewhat immersed. Sculpture very minutely wrinkled and spirally punctate, hardly discernible with 100 diameters, no liræ.

S. subglobosus Say. Apical whorl prominent, rather small, slightly everted, rounded, but not greatly constricted by the suture, obliquely flattened above. Sculpture, at first wrinkled or malleated, then more or less punctate on the upper surface, which rapidly becomes punctate-lirate, lirate below.

S. substriatus Walker. Apical whorl prominent, elevated, somewhat everted and obliquely flattened above, rounded, but not greatly constricted by the suture below. Sculpture, more or less irregularly wrinkled and malleated on the first half of the whorl, but becoming obsolete on the second half, no liræ.

S. trothis Doherty. Apical whorl bluntly elevated, everted and obliquely flattened above, not greatly constricted by the well impressed suture, rapidly enlarging. Apex not depressed below the surrounding whorl. Sculpture, quite well wrinkled at first, then spirally punctate above and obsoletely lirate below.

S. virginicus Walker. Quite similar to *pennsylvanicus*, to which it is allied, but the apical whorl is rather higher, rounded and more constricted by the suture, being more closely coiled. Sculpture, substantially the same in both.

S. walkerianus Aldrich. Apical whorl much elevated, more so than in any other species, except *wheeleri*, closely coiled, very convex and greatly constricted by the suture, everted and obliquely flattened above. Sculpture, strongly wrinkled at the tip, then spirally punctate-lirate.

S. wheeleri Walker. Apical whorl small, very much elevated, more so than in any other species, closely coiled, very convex, greatly constricted by the suture, much everted and obliquely flattened above. Sculpture, very strongly spirally punctate on the first half of the whorl, becoming punctate-lirate above on the second half, lirate below.

The examination of the material from Arkansas collected by Messrs. Hinkley and Wheeler furnished the following forms, which seem to be new.

SOMATOGYRUS WHEELERI, n. sp. Figs. 1 and 2.

Shell turbinate, umbilicate, rather thick and solid, greenish-horn color, smooth, with fine, regular, distinct lines of growth. Spire prominent, elevated, subturreted and rapidly acuminating to the apex. Apical whorl small, much elevated, closely coiled,

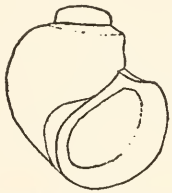

FIG. 1.—SOMATOGYRUS WHEELERI.

FIG. 2.—APEX OF SAME.

very convex and much constricted by the suture, much everted and obliquely flattened above, tip immersed: the first half of the whorl is very strongly spirally punctate, becoming punctate-lirate on the second half and lirate below. The second whorl is less convex and the suture below it is less impressed; as it passes into the third whorl it tends to become more or less shouldered. The third whorl is roundly shouldered above and distinctly flattened below the shoulder. The body-whorl is large, strongly shouldered, obliquely flattened above the shoulder with a distinct groove between it and the suture, distinctly flattened peripherally and rather rapidly rounding into the umbilicus. Aperture large, outer lip obliquely flattened and somewhat concave above the angle formed by the shoulder, from which it curves regularly to the columella. Columella narrow and oblique, adnate for only a short distance on the parietal

wall, the entire aperture is quite heavily calloused within Umbilicus quite large.

Alt. (apex eroded) 4, diam. 4 mm.

Types (33900 Coll. Walker), from the Ouachita River, Arkadelphia, Ark. Cotypes in the collection of Rev. H. E. Wheeler.

This species, named after its discoverer, while related to the shouldered species of *Somatogyrus* from Alabama, is quite distinct by reason of its larger umbilicus, flatly shouldered body whorl and elevated apical whorls.

SOMATOGYRUS AMNICOLOIDES n. sp. Fig. 3.

Shell small, subglobose, narrowly umbilicate, rather thin, pale horn-color, smooth, with very fine, regular lines of growth. Spire obtusely elevated, flatly rounded. Apical whorl scarcely at all everted, only slightly elevated above the second whorl, not constricted by the suture, which is well impressed, but vertical, sculpture practically obsolete. The second whorl is convexly rounded, but not high. The third whorl is proportionately higher, rounded above and less so below. Body-whorl globosely rounded. Aperture angled above, wider and

FIG. 3. SOMATOGYRUS AMNICOLOIDES.

FIG. 4. SOMATOGYRUS CRASSILABRIS.

obliquely rounded below. Lip sharp, but callously thickened within, meeting the columella in a projecting, broadly rounded angle. Columella nearly straight, scarcely at all thickened, inner lip adnate to the body-whorl on the parietal wall. Umbilicus rather narrow, but conspicuous.

Alt. 3.5, diam. 2.75 mm.

Types (No. 40012 Coll. Walker), from the Ouachita River, Arkadelphia, Ark., collected by the Rev. H. E. Wheeler. Cotypes in his collection.

This small species is about the size and shape of an *Amnicola* as suggested by the specific name. But, although the columella is scarcely at all calloused, the distinct thickening of the outer lip and the projecting angle at the junction of the outer lip and the columella forbid its reference to that genus. It is entirely unlike any of the other species known from Arkansas and quite different from any of the eastern forms.

SOMATOGYRUS CRASSILABRIS n. sp. Fig. 4.

Shell subglobose, scarcely perforate, very thick and solid, greenish horn-color, smooth with very fine lines of growth. Spire short, subacute and small in comparison with the body-whorl. Whorls 4. Apical whorl small, rounded, constricted by a rather deep suture, everted, obliquely flattened above, strongly and regularly spirally punctate above from the tip, lirate below. The second and third whorls rather rapidly increase in size, are rounded above, but less below, the suture being well impressed. Body-whorl large, obtusely shouldered, obliquely flattened above the shoulder, distinctly flattened between the shoulder and the periphery, below which it is rounded. Aperture rather large, narrower, but scarcely angled above, and obliquely rounded below. The outer lip is scarcely modified by the shoulder, very thick and heavy, rounded and distinctly everted below. Columella very thick and heavy, rounded. Inner lip adnate to the parietal wall and heavily calloused. The whole aperture is surrounded by an excessively thick deposit of callus. Umbilicus small, scarcely perforate, with a distinct groove below.

Alt. 4.33, diam. 4 mm.

Types (No. 38823 Coll. Walker), from rocks on muddy bank of the North Fork, Norfolk, Ark., collected by A. A. Hinkley. Cotypes in his collection.

This species, though evidently related to *wheeleri* by reason of its shouldered body-whorl, differs decidedly in the characters of the apical whorls, the less pronounced shouldering of the body-whorl, the smaller umbilicus and, especially, in the remarkable thickening of the aperture. In this particular it is quite distinct from any of the other described species.

NOTES ON THE WEST AMERICAN SPECIES OF FUSINUS.

BY WILLIAM H. DALL.

The genus *Fusinus*, better known by its preoccupied name of *Fusus* Lamarck, is fairly well represented by species on the Pacific coast.

The largest, most conspicuous, and best known of these is *F. dupetitthouarsi* Kiener, 1840, originally described from a Galapagos Island specimen and which has since been collected at a point as far north of Panama on the mainland as Cerros Island in latitude 28°. It undergoes no great variation in this wide area of distribution.

F. kobelti Dall, 1877, has been collected from the vicinity of Monterey and south to Catalina Island.

F. sulcatus Lamarck, 1822, is found at Panama, and appears to be distinct from *F. fontainei* Orbigny, 1841, which is a native of Peru and Chile, and of which *F. alternatus* Philippi, 1847, is a synonym.

F. colpoicus new species, is found off Guaymas, Gulf of California, and resembles *F. barbarensis* Trask, when the latter is about 60 mm. long, but differs by having 13 instead of 11 axial ribs, which are narrower and with wider interspaces while the revolving threads are sharper and more conspicuously alternated. At a length of 66 mm. it has eight whorls without counting the eroded nucleus; three of the spirals near the periphery are more conspicuous than the rest; at the end of the penultimate whorl there are 6 major and 6 minor spirals which pass over the ribs without becoming nodulous. The aperture and canal together measure 36 mm. in the length, and the canal is conspicuously tortuous. The maximum diameter of the shell is 18 mm. (U. S. N. Mus. No. 111,111).

The peculiar *F.* (*Roperia*) *roperia* Dall, 1898, is still only known by the type specimen from San Pedro; *F. cancellarioides* Reeve, 1848, only from the Chilean coast. An unidentified worn shell sent from La Paz by Kantus, seems distinct from the others but is not fit to serve as a basis for a name.

There is a group of species found in the central Californian region which were described by Trask in 1855. *F. traski* Dall,

(new name for *F. rugosus* Trask, not of Lamarck, 1804) is recognized by its abruptly shouldered whorls, and ranges from San Pedro to San Diego.

F. monksæ Dall (new name for *F. robustus* Trask, 1855, not of Beyrich, 1853) is very similar to the next species, but generally heavier and with a shorter canal. It ranges from Banks Island, British Columbia to Pequena Bay on the west side of Lower California.

F. barbarensis Trask, ranges from the Oregon coast to San Diego. For a long time it was known only by adolescent specimens, but I have received a pair 135 mm. long by 38 in diameter, dredged off Newport, by Doctor Tremper.

F. ambustus Gould, 1851, ranges from the Gulf of California to Topolobampo, Mexico. The burnt-sienna blotches on the axial ribs from which the species derived its name, though conspicuous on fresh specimens, gradually fade out after some years in the cabinet.

F. harfordi Stearns, from Mendocino County, California, may belong with *Chrysodomus* but the sculpture recalls that of *Fusinus*.

F. panamensis Dall, 1908, is still only known by the original specimens from Panama Bay. There is a small mottled species belonging to the same group (*Aptyxis?*) as *F. pulchellus* Philippi, Mediterranean, which ranges from the Gulf of California to Panama. It has been labeled by some error *F. cinereus* Reeve, (which is Say's *Urosalpinx*) in the collection. It agrees very well with the figure of Reeve's *F. taylorianus* in the Iconica, and until further data are received about Reeve's type which was of unknown habitat, may best retain that name. A specimen has been received as from San Pedro, but I doubt the accuracy of this attribution.

F. luteopictus Dall, 1877, ranges from Monterey to the Gulf of California. The yellow color of the ribs fades in time, leaving the prominences nearly or quite white.

A little brownish species has been received from San Pedro Bay from several collectors, which seems to be undescribed. It has five whorls without the nucleus, four or five strong spiral threads between the sutures on the spire and 13–15 on the last whorl, with a few minute and irregular intercalary threads ; the

interspaces are crossed by minute axial lamellae and the last whorl has eight rather ill-defined wide axial ribs, most distinct near the periphery. The shell is about 11 mm. long by 5.5 mm. wide, and 5 mm. of the length is included in the spire. It may take the name of *F. diminutus.*

F. porticus n. sp. This is a small purple-brown form which may perhaps prove not to be a *Fusinus*, yet seems difficult to refer elsewhere, so I adopt the term provisionally. It has three conic, wine-colored, polished, nuclear whorls followed by a little more than four sculptured whorls, having the general profile of a slender *Alectrion;* it has on the last whorl ten axial ribs with wider interspaces; the spiral sculpture consists of fine rather sharp threads, two of which near the periphery are slightly larger, and prominent where they cross the axial ribs, with a single fine thread in the space between them; on each side of this pair between the sutures are three or four finer threads; the spire is longer than the aperture; the outer lip sharp, plain within, no callus on the inner lip, the canal short, twisted and slightly recurved. Height of shell 11.0; of spire 7.0; maximum diameter 5.0 mm. It is an inhabitant of Panama. (U. S. N. M. No. 76275).

F. centrifugus n. sp. Shell with three smooth conoid nuclear whorls, followed by six and a half strongly sculptured whorls; suture appressed; axial sculpture of numerous sharp thin elevated lamellae, raised into a retractively looped frill in front of the suture and similarly but less prominently looped between its intersections with the spiral threads: on the last whorl are eight prominent rounded ribs with subequal interspaces, which extend from the suture to the base; between the sutural frill and the shoulder of the whorl are three inconspicuous spiral threads; on the shoulder one very prominent cord flattened and produced at the summit of each axial rib into a spade-shaped, not pointed, horizontal spine; between this cord and another less prominent cord in front, are one to three small spiral threads; a third still less prominent cord forms the margin of the base in front of which are about a dozen spiral threads which are more prominent on the canal. The color of the shell is brownish, more livid inside the aperture; the canal produced

and straight, the outer lip sharp but probably immature. Height of shell 22; of spire 12; maximum diameter 10 mm. It was collected at the Galapagos Island in 33 fathoms, sandy bottom. Though evidently not full grown, the sculpture of this shell would identify it at any age. (U. S. N. M, 96370).

F. (?) *orcutti* n. sp. Nuclear whorls lost, the remaining five whorls solid, with appressed suture; axial sculpture of rude lines of growth and (on the last whorl eight) obscure low ribs; spiral sculpture of broad, somewhat irregular, straplike spirals and much smaller spiral threads; of the former there is one at the suture followed by three or four threads; two at the shoulder closely adjacent, followed by two threads; and four or five in front of the periphery alternated by single threads; the color of the shell is light yellow brown with axial rows of dark brown spots on the ribs, the aperture white: the outer lip is sharp, with three or four obscure nodules within the aperture: a thin white callus on the inner lip, the canal short and slightly recurved. Height of shell 17; of spire (without the nucleus) 10; maximum diameter 8 mm.

It was collected at Mazatlan by C. R. Orcutt and resembles a *Latirus* except that the pillar is without plaits. (U. S. N. Mus. No. 252697).

LASMIGONA SUBVIRIDIS CONRAD, REDIVIVUS.

BY L. S. FRIERSON.

Lasmigona subviridis, Conrad. Probably few conchologists are aware of the validity of this name, since it occurs in no synoptical list of *Unionidæ* known to the writer.

Rafinesque published a species, *Unio viridis*, in his Monograph of 1820, a work virtually introduced to American conchologists by Mr. Poulson's translation in 1831.

In the autumn of 1835, Mr. Hyde gave specimens of a *Unio* from the Juniata River to both Dr. Lea, and Mr. Conrad. The latter published the shell, with an excellent figure, on plate 9, of his new fresh-water shell, under the name of *Unio viridis?* Mr. Conrad stated that he was uncertain whether this identifi-

cation was correct, since Rafinesque's shell came from the Ohio drainage, and these Hyde shells from the Atlantic drainage. In case these latter should prove distinct Conrad proposed the name—*Unio subviridis*. In the following year Dr. Lea published the same shell under the name of *tappanianus*, but in the meantime Conrad had published the shell a second time (Monography of Unionidæ, 1836) as *viridis* (Rafinesque). Dr. Lea up to his death, claimed the shell, on the ground that it was not *viridis* Rafinesque, and that Conrad's name *viridis* was a synonym.

Conrad, on his part, persisted that his identification was correct, because a single valve of this shell in Mr. Poulson's collection had been labeled *viridis* by Rafinesque. The confusion thus wrought, is now eighty years old.

Rafinesque, in 1820, described very clearly a shell from the Ohio drainage, under the name of *viridis*, which Dr. Lea (*as he frequently did*) redescribed several years later, under the name of *compressa*. In 1831, Rafinesque labeled for Mr. Poulson, a single valve of a shell under the name *viridis* which valve Conrad stated was identical with the Hyde shells. It is worthy of note, that if this valve was not correctly named by Rafinesque, it was an *exceedingly close guess*, as the two species are so close that they are often confounded yet. That Dr. Lea was so positive that this label was incorrect, proves conclusively that Lea was fully aware that the true *viridis* of Rafinesque was the *compressa*, (*or pressus*) of Lea. Of course, Lea was too "cute" to call attention to this fact, since he would then lose this name also, nor did he have generosity enough to give the Hyde shells to Conrad under the name *subviridis*, of which he was fully cognizant.

Subviridis Conrad was elegantly figured on plate 9, in an appendix to "New Fresh Water Shells." The appendix is dated 1835, and was only bound in a few copies of the book, and this accounts for the total omission of the name, or plate, by Mr. C. T. Simpson, and other authors. The correct synonymy of these two species therefore (omitting some unimportant names) is as follows—

LASMIGONA SUBVIRIDIS (Conrad).

Unio viridis? Conrad, 1835, New Fresh Water Shells, appendix, plate 9, Fig. 1, *or subviridis* Conrad, if new.

Unio viridis Conrad (as of Rafinesque), Monography, 1836 : Synopsis 1853.

Unio tappanianus Lea, 1836.

Symphynota viridis Simson, 1900, (*as of Conrad !*) ; also in Catalog, 1914.

Lasmigona viridis (Rafinesque).

Unio viridis Rafinesque, Monograph, 1820.

Symphynota compressa, Lea, 1829.

Complanaria alasmodontina, Stimpson, 1851.

Margaron pressus Lea, 1852.

Symphynota compressa Lea, Simpson, 1900 and 1914.

Because of the *Symphynota* of Lea being an exact synonym for Rafinesque's genus *Proptera*, and the earlier use (in *Unio*) of the name *compressus*, neither the name *compressa* nor *pressus*, can be used, and if Rafinesque's name be disallowed by the weak-kneed, *Stimpson's* name takes precedence.

PUBLICATIONS RECEIVED.

The Naiades of Missouri. By William I. Utterback, published in the American Midland Naturalist, Notre Dame, Ind. Vol. iv, 1915. In the May number the first part of this paper appeared. It consisted of 13 pages, containing an introduction with a general key to the families and genera. The July number contains part ii, comprising 56 pages covering the Margaritanidae, genus *Cumberlandia* and the Unionidae, genera *Fusconaia*, *Amblema*, *Megalonaias* N. gen. Type, *Unio heros* Say, *Quadrula* and *Rotundaria*. With the July number was a supplement containing 28 plates illustrating the species, collecting grounds etc. The paper is to be continued. C. W. J.

The Philippine Land Shells of the genus Chistoloma. By Paul Bartsch, (Proc. U. S. Nat. Mus., Vol. 49, pages 195–204, pl. 15.) A new subgenus *Hololoma*, type *Megalomastoma quadrasi* Hidalgo, and seven new sub-species are described.

The recent and fossil mollusks of the genus Rissoina from the west coast of America. By Paul Bartsch, (Proc.

U. S. Nat. Mus., vol. 49, pages 33–62, with plates 28–33). An interesting introduction giving a history of the work done in this genus, with a key to the species, followed by the descriptions of 38 species of which 22 represent new species. *R. signæ* is proposed for *R. insignis* De Folin, 1867, not *R. insignis* Adams and Reeve 1850. Only one of the number is fossil. The figures are excellent.

Etude sur le Littorina obtusata et ses variations. Par. Ph. Dautzenberg et H. Fischer. (Journ. de Conch., vol. 62, pages 87–128, plates 2–4). A most interesting study of the variations of this species. A complete bibliography is followed by notes and descriptions of the varieties or form, which are grouped under the typical *obtusata* and the sub-species *littoralis*. The former is divided on form into *typica*, *elatior* and *palliata* and 9 vars. on color, and the latter into 5 vars. on form and 12 on color. Only *palliata* is recorded from the mainland of N. America. *L. littoralis* is recorded from Greenland. That *L. palliata* was only a var. of *obtusata* has long been the opinion of the writer, from the large series before me, representing 18 localities, cover the area from Eastport, Me., to Narragansett, Pier, R. I. A large percentage have the obtuse shoulder on the body whorl and cannot be separated from European specimens of *littoralis*. The color vars. *typica*, *lutea*, *castanea*, *balteata*, *ornata lineolata* and *tessellata* are also represented.

C. W. J.

NOTES.

Lymnaea (Pseudosuccinea) columella Say in Oregon : Mr. John A. Allen has found this species in Oswego Lake and Duck Pond, Oswego, Clackamas Co., Oregon. They were collected during April and May, 1913 and in February 1914. This is new to the west coast, I believe, and probably was introduced from the eastern United States. E. G. Vanatta.

Dr. H. A. Pilsbry left on August 4th for New Mexico (via San Francisco). He expects to return about the end of September.

THE NAUTILUS.

VOL. XXIX. OCTOBER, 1915. No. 6

NOTES ON AMERICAN SPECIES OF MACTRELLA.

BY WILLIAM H. DALL.

The species of *Mactrella* are extremely elegant shells, especially those with concentric undulations. There are but few of them altogether, and usually not more than two species in any given fauna, of which one is usually smooth and the other undulated, as in the case of the genus *Labiosa*. They are so fragile that they are generally broken by the waves when cast on the beach, and, being burrowers, are rarely obtained by the dredge, hence are rare in collections. They are confined to the warmer waters of the globe and perhaps most numerous, though not of largest size, among the islands off the coast of southern Asia.

There is but one species in the American Atlantic tropics, the *Mactra alata* Spengler, 1802. Gmelin confounded it with the *M. striatula* Linné, and Lamarck gave to the same combination of the hinge elements, Gray in January, 1853, founded his genus *Mactrella*, while in April of the same year Mörch proposed for it the genus *Papyrina*.

The only other East American species known to date is the *Mactrella iheringi* Dall (Nautilus, Mar. 1897; figured in Proc. U. S. Nat. Museum, 1902, pl. 32, fig. 8) from the coast of southern Brazil, which approaches more nearly to the typical Mactras in general form than any other species of the genus.

The West American analogue of *M. alata* is the *M. exoleta* Gray (1838) which differs by having the margin of the escut-

cheon angular instead of keeled, and which was named *Lutraria ventricosa* by Gould in 1851. The radial ridges on the escutcheon are individually variable and the worn valve for which Mörch (Nal. Blatt. 1861) proposed the name of *subalata* was a specimen of *alata* either derived from ballast or otherwise transported from the Atlantic coast of Costa Rica.

A new species from the west coast of Mexico and belonging to the group of *M. alata* is described below.

The *Mactrella* (*Harvella*) *elegans* Sowb,. is one the most beautiful and fragile bivalves of the family. Confounded with *Rœta canaliculata* by early writers, it was referred to the Florida fauna in the Conchologia Iconica. This error, and a certain variability of outline common to most Mactridæ, led Conrad in 1867 to propose the name of *pacifica* for the supposed Pacific coast form. But there is at present no evidence that such a shell occurs in Atlantic waters.

The known distribution of the American species of the group is as follows:

ATLANTIC WATERS.

MACTRELLA ALATA Spengler.

Porto Rico, Jamaica, Nicaragua, Costa Rica, the north coast of South America and south to Ceara, Brazil.

MACTRELLA IHERINGI Dall.

Santos and Sao Paulo, Brazil.

PACIFIC WATERS.

MACTRELLA EXOLETA Gray.

Mazatlan, West Mexico, to Panama and Guayaquil.

MACTRELLA CLISIA n. sp.

Manzanillo, West Mexico, to Santa Elena, Ecuador.

MACTRELLA (HARVELLA) ELEGANS Sowerby.

Panama.

MACTRELLA CLISIA n. sp.

Shell white, extremely arcuate, with the silky periostracum

varying from pale strawcolor to blackish brown ; anterior slope longer than the posterior, rather conspicuously compressed and attenuate, with no circumscribed lunule ; posterior slope flattened, externally bordered by a sharp angle surmounted, as in *M. alata*, by an elevated thin keel ; the inner margins pout a little near the beaks, the middle of the flattened space has in each valve a single conspicuous rib ; the cordate space between these ribs are somewhat concave ; the spaces between the ribs and the keels are flat and from the distal ends of the ribs to these of the keels the valve margin show a wide lanceolate gap ; there is also a narrow anterior basal gap ; the hinge is normal ; the surface of the valve smooth except for lines of growth ; the pallial sinus short and angular ; the basal margin prominently arcuate and the middle of the shell inflated. Length 78, height 66, diameter 34 mm.

There is a constriction in front of the keel which varies in strength in different specimens. The shell is divided from *M. exoleta* by the presence of the keel, the latter possessing only an angle ; it differs from *M. alata* in its exaggerated arcuation, much higher beaks and anterior attenuation.

STUDIES IN NAJADES.

BY A. E. ORTMANN.

(*Continued from page 143, Vol. 28.*)

EURYNIA (MICROMYA) PERPURPUREA (Lea) (See *Lampsilis perp.* Simpson, 1900, p. 558).

I collected, on Sept. 20, 1912, a number of males in Clinch River, at Richland, Tazewell Co., Va., and on Sept. 21, 1912, a single gravid female, with glochidia, at Raven, Tazewell Co., Va.

Anal separated from the supraanal by a rather short mantle connection, which is shorter than the anal. Inner edge of anal with very distinct crenulations. Branchial with papillae. In front of the branchical, the female has about 10 subcylindrica or subconical papillæ of medium size, which are rather distant from each other, and of slightly variable size, and do not extend

quite to the middle of the mantle margin. In the male, these papillæ are also indicated, but very small and indistinct.

Palpi connected on the posterior margin at base only. Inner lamina of inner gills entirely connected with abdominal sac. Gills typically Lampsiline: the marsupium of the female is kid. ney-shaped, and located in the posterior half of the outer gill- with a small non-marsupial part at the posterior end of the gill- The number of ovisacs in my specimen is 12.

Glochidia nearly subspatulate, considerably higher than long. Length: 0.21, Height: 0.27 mm.

Color of soft parts whitish. Mantle-margin blackish in the region of the anal and branchial, the blackish pigment extend, ing forward along the base of the papillæ. Edge of marsupium broadly black.

Simpson places this species by the side of *E. trabalis* (Conrad). According to the anatomy this affinity is correct. Also the glochidia are similar. Although I have called them in *trabalis*, (l. c. p. 340) "subovate," they are almost subspatulate, as is clearly seen in the figure (pl. 20, f. 4).

Eurynia (Micromya) nebulosa (Conrad) (See: *Lampsilis n.* Simpson, 1900, p. 553).

I collected a large number in North Fork Holston River, Saltville, Smyth Co., Va. (Sept. 17, 1912), and in Clinch River, at Cedar Bluff, Richland, and Raven, Tazewell Co., Va. (Sept. 20 and 21, 1912). The preserved gravid females all had glochidia.

Anal separated from the supraanal by a moderate mantel-connection, which is shorter than the anal. Inner edge of anal crenulated. Branchial with papillae. In front of the branchial, in the female, there are 6 to 10 rather large, conical papillae, somewhat irregular in size, and remote from each other: the largest are forward. These papillae do not quite reach the middle of the mantle margin. In the male, these papillae are also indicated, but very small.

Palpi connected at the posterior margins at base only.

Inner lamina of inner gills connected with abdominal sac. Gills lampsiline: the marsupium of the female is kidney-shaped,

and occupies the posterior half (or more) of the outer gill, with a small non-marsupial section at the posterior end. Ovisacs 10 to 17.

Glochidia almost subspatulate, higher than long; 4, length 0.22, height 0.29.

Color of soft parts whitish. Anal and branchial opening with black pigment, and this black color runs forward along the outer mantle edge in front of the branchial; on the inside of the inner edge there is a reddish-brown streak, and also the papillæ are reddish-brown. The marsupium has a broad black edge.

This species resembles much *E. iris* (Lea) in shell characters, and also the anatomy and the glochidia are very similar. The papillæ of the mantle edge are not quite as large as those of *E. iris*, and they are more variable in number and position. In *nebulosa* the largest and most distinct papillæ are in the anterior part, where three or four sometimes stand a little closer together.

The shell of some of my females is undistinguishable from *U. amoenus* Lea (Simpson, p. 555), and I think that *amoenus* is an additional synonym of *nebulosus* (Conrad).

EURYNIA (MICROMYA) VANUXEMENSIS (Lea) (See: Ortmann, 1912 pp. 342).

I collected a number of specimens on Sept. 17, 1912 in North Fork Holston River, Saltville, Smyth Co., Va. Among them were gravid females with glochidia.

Mantle connection between anal and supraanal moderately long, but shorter than the anal. And with distinct crenulations. Branchial with papillae.

Papillae in front of the branchial of the female as described previously. The largest papillae are well forward. In the male, the papillae are represented by mere crenulations. Palpi connected only at base of posterior margin.

Inner lamina of inner gills entirely connected with abdominal sac. Marsupium as described previously, minimum number of ovisacs 7, maximum 14. Edge of marsupium with brown or black pigment.

Shape of glochidia as figured (1. c. pl. 20, f. 6), but they should be called subspatulate. Length: 0.23, height: 0.30 mm;

my former measurements, 0.22+0.28, do not differ much from this.

This species has a very characteristic shape, chiefly in the female, with the postbasal part greatly expanded and obliquely truncated. In old specimens, there is a more or less distinct "constriction" in the middle of this truncation, making the boundary between the branchial opening and the papillar part of the mantle edge in front of it. This constriction corresponds to that seen in the following species (*E. constricta*), and shows the close affinity of these two species. *E. vanuxemensis*, in its external aspect, is very similar to *E. constricta*, and when I found these specimens at Saltville, I recognized them at once as the representative form of *E. constricta* of the Roanoke and James Rivers, with which I was quite familiar. However, the character of the constriction, found rather regularly in old females of *constricta*, is not so well developed in *vanuxemensis*, and I have only a few old females of the latter, which show it distinctly.

Eurynia (Micromya) constricta (Conrad) (See: *Lampsilis c.* Simpson, 1900, p. 551).

Numerous specimens are at hand from the following localities: Calf Pasture River, Goshen (May 11, 1912), North River, Lexington and Buena Vista (June 7 and 8, 1912), all in Rockbridge Co., Va.; Jackson River, Covington, Allegheny Co. Va. (Aug. 11, 1911); Tinker Creek, Roanoke (June 10, 1912), Roanoke River (June 10, 1912) and Mason Creek, Salem (Aug. 13, 1911); these in the Roanoke drainage in Roanoke Co., Va. The specimens collected on August 13 were gravid with eggs and one had young glochidia; those collected in May and June had all glochidia, when gravid, and on all dates discharging individuals were found. Thus the breeding season begins in August and ends in June.

Supraanal separated from the anal by a moderately long mantle-connection, which is slightly shorter than either opening. Anal finely crenulated. Branchial with papillae. In the female, the inner mantle-edge in front of the branchial is very much like that of *vanuxemensis* and *arkansasensis*: it is somewhat lamellar and carries a number (10 to 12) of small, somewhat

distant and irregular papillae, of which the largest are placed more anteriorly, while the posterior ones are indistinct. A black streak of pigment is present. Also the male has this black pigment, but the papillae are obsolete.

Posterior margins of palpi connected at base. Inner lamina of inner gills entirely connected with abdominal sac. Marsupium with from 12 to 20 ovisacs. Edge of marsupium with black pigment. Holes at the edge were observed in discharging females.

Glochidia subspatulate, higher than long. Length: 0.21, height: 0.27 mm.

Except the black pigment on mantle edge in the posterior region, and on the edge of the marsupium, the color of the soft parts is whitish.

This species is closely allied to *E. vanuxemensis*. The papillae in front of the branchial are smaller and less crowded, and the black pigment is not so intense.

(*To be concluded*)

NOTES ON OLIVA.

BY E. G. VANATTA.

The Academy of Natural Sciences of Philadelphia having purchased the John Ford Collection of *Oliva*, the following notes may be useful to those interested in the genus.

OLIVA PERUNIANA Lam.

The typical form is illustrated in Reeve's Conch. Icon. vol. vi, pl. 9, f. 14 *d;* Tryon's Man. Conch. vol. v, pl. 18, f. 58.

Var. *fulgurata* Mart., Rve. Conch. Icon. pl. 9, f. 14 *b.;* Tryon M. C. pl. 18, f. 56.

Var *livida* Johns.

The types are pale lilac with ivory-yellow streaks, A. N. S. P. Coll. No. 111726. Alt. 40, diam. 20 mm.

Habitat—unknown.

NAUTILUS vol. 24, p. 122; Tryon M. C. pl. 18, f. 55; Rve. C. I. pl. 9, f. 14 *a.*

Var. *castanea* "Ford" Johns.

The types are in the A. N. S. P. Coll. No. 111603 from Peru. Alt. 43.5, diam. 22 mm.

Nautilus vol. 24, p. 122 ; Rve. C. I. pl. 9, f. 14 *c;* Tryon M. C. pl. 18, f. 57.

Var. *subcastanea* n. var.

This form is brown with zigzag darker brown lines. It is similar to *castanea* in color but with streaks somewhat like *fulgurata.* Alt. 41.5, diam. 21.5 mm.

The types are A. N. S. P. Coll. No. 111688 from Peru. This seems to be the form figured by Reeve. C. I. pl. 9, f. 14 *e.*

Oliva annulata Gmel.

Chenu Ill. Conch. pl. 16, f. 6 ; Sby. Thes. Conch. 5 (332), fig. 60.

Var. *amethystina* Bolt. Tryon M. C. pl. 19, f. 64, 66.

Var. *mantichora* Ducl. Tryon M. C. pl. 19, f. 65.

Oliva bulbosa Bolt.

Tryon, M. C. pl. 20, f. 71, 74.

Var. *tuberosa* Bolt. Tryon M. C. pl. 19, f. 68, 69.

Var. *inflata* Lam. Tryon M. C. pl. 20, f. 73.

The types of *ovum-ralli* Ford were not found, but A. N. S. P. Coll. No. 14709 is part of the original lot presented by Mr. J. Ford.

Var. *fabagina* Lam. Tryon. M. C. pl. 19, f. 70, pl. 20, f. 72.

Var. *immaculata* n. n.

Shell pure white. Alt. 45.5, diam. 25 mm. the types are A. N. S. P. Coll. No. 111630 from the Indo-Pacific. It is *Oliva bulbosa alba* Johns. (not Lam.) Nautilus vol. 28, p. 101 ; Thes. Conch. vol. IV, pl. 13 (340), f. 191.

Oliva tigrina Lam.

Tryon. M. C. pl. 20, f. 77, 80.

Var. *fallax* Johns. The types are A. N. S. P. Coll. No. 111575 from Ceylon. Alt. 44.5, diam. 24 mm. Nautilus vol. 24, p. 65 ; t. c. vol. 28, p. 100 ; Tryon M. C. pl. 20, f. 78.

Oliva tricolor Lam.

Tryon M. C. pl. 21, f. 86.

Var. *philantha* Ducl. Tryon. M. C. pl. 21, f. 87.

Oliva variegata Bolt.

Tryon. M. C. pl. 23, f. 27.

Var. *reticulata* Bolt. Tryon. M. C. pl. 23, f. 28.

Oliva oliva L.

Tryon M. C. pl. 1, f. 5 ; pl. 23, f. 24.

Var. *fenestrata* Bolt., Tryon M. C. pl. 23, f. 23.

Var. *fulminans* Lam., Tryon M. C. pl. 23, f. 22.

Var. *sepulturalis* Lam., Tryon M. C. pl. 23, f. 21.

Var. *macleaya* Ducl., Tryon M. C. pl. 13, f. 26.

Oliva sericea Bolt.

Tryon M. C. pl. 27, f. 59, 60.

Var. *tremulina* Lam., Tryon M. C. pl. 25, f. 48.

Var. *pica* Lam. Tryon M. C. pl. 26, f. 51.

Var. *tenebrosa* Marr., Tryon M. C. pl. 25, f. 49.

Var. *porphyritica* Marr., Tryon M. C. pl. 26, f. 53.

Var. *sylvia* Ducl., Tryon M. C. pl. 27, f. 57.

Var. *zeilanica* Lam., Tryon M. C. pl. 24, f. 32.

Var. *ornata* Marr., Tryon M. C. pl. 24, f. 31 ; pl. 25, f. 45.

Form *lignaria* Marr., Tryon M. C. pl. 25, f. 44.

Var. *marrati* Johns.

The types are A. N. S. P. Coll. No. 111862, from the Indo-Pacific. Alt. 71.5, diam. 30 mm. Nautilus vol. 24, p.51 : t. c. vol. 28, p. 99 ; Sby. Thes. Conch. pl. 7 (334), f. 109.

Var. *cryptospira* Ford.

The type is A. N. S. P. Coll. No. 111611 from Mauritius. Alt. 55.5, diam. 24 mm., P. A. N. S 1891 p. 99.; Nautilus vol. 28, p. 99 ; Chenu. Ill. Conch. pl. 30, f. 11.

Var. *fordi* Johns.

The type is A. N. S. P. Coll. No. 111612 from (Mauritius). Alt. 44, diam. 17 mm., Nautilus vol. 24, p. 51 ; t. c. vol. 28, p. 98 : Sby. Thes. Conch. pl. 9 (336), f. 126 ; Chenu. Ill. Conch. pl. 30, f. 12.

Var. *albescens* Johns.

The type is A. N. S. P. Coll. No. 111753 from Baker Island, S. Pacific. Alt. 42, diam. 14.3 mm. Nautilus vol. 28, p. 99.

Oliva spicata Bolt.

Tryon M. C. pl. 27, f. 62.

Var. *hemphilli* "Ford" Johns.

The types are A. N. S. Coll. No. 111697 from San Ignacio Lagoon, Lower California. Alt. 53.5, diam. 23 mm. Nautilus vol. 24, p. 122 ; t. c. vol. 28, p. 115.

Var. *subangulata* Phil. Tryon M. C. pl. 28, f. 65.

Var. *oniska* Ducl.

The types of *O. perfecta* Johns. are A. N. S. P. Coll. No. 111729 from West Coast Central America. Alt. 58.5, diam. 25 mm. Nautilus vol. 24, p. 122 ; t. c. vol. 28, p. 116 ; Rve. C. I. pl. 10, f. 16 *g* ; Tryon M. C. pl. 27, f. 61 ; Chenu Ill. Conch. pl. 32, f. 9.

Var. *pindarina* Ducl. Tryon, M. C. pl. 28, f. 64.

Var. *maria* Ducr. This is the very light colored form much like var. *venulata*. Tryon M. C. pl. 29, f. 78 ; Chenu. Ill. Conch. pl. 33, f. 11.

Var. *ustulata* Lam. Tryon M. C. pl. 28, f. 66.

Var. *graphica* Marr. Tryon M. C. pl. 28, f. 63.

Var. *violacea* Marr. Tryon M. C. pl. 28, f. 70.

Oliva reticularis Lam.

Tryon M. C. pl. 30, f. 90, 91, 94, 95 ; pl. 34, 57.

Var. *formosa* Marr. the small brown form. Tryon M. C. pl. 31, f. 100.

Var. *nivosa* Tryon Marr. Tryon M. C. pl. 31, f. 1.

Var. *bifasciata* Küster. The large brown form. Tryon M. C. pl. 31, f. 99.

var. *olorinella* Ducl.

Tryon. M. C. pl. 31, f. 2.

var. *tisiphona* Ducl.

This is the globose, grayish form of Northern S. America.

Tryon. M. C. pl. 30, f. 93.

Oliva sayana Ravenel.

Tryon. M. C. pl. 31, f. 5.

var. *citrina* Johns.

The types are A. N. S. P. Coll. No. 111642 from Long Key, Florida.

Alt. 48. 5, diam. 19 mm.

Nautilus, vol. 24, p. 123 ; t. c. vol. 28, p. 114.

OLIVA ISPIDULA L.

var. *candida* Lam. White form.

Tryon. M. C. pl. 33, f. 32, 36.

var. *flaveola* Lam. Yellow form.

Tryon. M. C. pl. 33, f. 40.

var. *tigridella* Ducl. The form with small dark spots.

Tryon. M. C. pl. 33, f. 35.

var. *taeniata* Link. The form with a broad subsutural dark band.

Tryon. M. C. pl. 33, f. 37, 39.

var. *stellata* Ducl. The form with broad brown markings.

Tryon. M. C. pl. 33, f. 42.

var. *gratiosa* n. var.

Shell slender, dark brown, spire elevated, columellar callus cream-white.

Alt. 32.5, diam. 12.5 mm.

The type is A. N. S. P. Coll. No. 111869 from the Philippines. This form may be Chenu Ill. Conch. pl. 8, f. 13 ; Sby. Thes. Conch. pl. 16 (343), f. 252.

var. *algida* n. var.

Shell oblong, bluish white with longitudinal light brown streaks, lip yellowish brown, spire short, columellar callus white, posterior angle of the aperture provided with a brown and white callus.

Alt. 36.5, diam. 18 mm.

The type is A. N. S. P. Coll. No. 14986, habitat unknown, gift of J. S. Phillips. This is probably Reeve's Conch. Icon. pl. 17, f. 34 *i*.

var. *samarensis* Johns.

The types are A. N. S. P. Coll. No. 111759 from Samar Island, Philippine Is. collected by E. L. Moseley.

Alt. 37.5, diam. 14 mm.

OLIVELLA BIPLICATA LAPILLUS n. var.

Shell globose, white, spire short, interior of the aperture cream-colored.

Alt. 24, diam. 14 mm.

The type is A. N. S. P. Coll. No. 111977 from San Pedro, California, collected by Mrs. E. M. Gaylord.

It is the *Olivella biplicata alba* Wlms. (not Marr.). It is figured in Sby. Thes. Conch. IV, pl. 18 (345), f. 290. Some specimens have lilac on the columella.

OLIVELLA GRACILIS GAYLORDI Ford.

The types are A. N. S. P. Coll. No. 111804 from the Gulf of California.

NAUTILUS, vol. 8, p. 104.

OLIVELLA BLANESI Ford.

The types are A. N. S. P. Coll. No. 111788 from Cardenas, Cuba. NAUTILUS vol. 12, p. 66.

Var. *albata* nn.

Shell globose, white, spire elevated. Alt. 7, diam. 3.5 mm.

This is *Olivella blanesi alba* Ford (not Marr.), NAUTILUS vol. 12, p. 67, from Cardenas, Cuba, collected by Francisco Blanes. The types are A. N. S. P. Coll. No. 111789.

AGARONIA GIBBOSA Born.

Tryon M. C. pl. 36, f. 85, 87.

Var. *aurantia* Johns.

The types are A. N. S. P. Coll. No. 111739 from the Indian Ocean. Alt. 55.5, diam. 28.5 mm. NAUTILUS vol. 28, p. 103; Tryon M. C. pl. 36, f. 86; Chenu. Ill. Conch. pl. 18, f. b.

NOTES.

HELIX PISANA MULL., IN CALIFORNIA.—While in San Diego in July 1914 Mrs. Kate Stephens, Curator of the San Diego Society of Natural History, showed me 4 specimens of a snail that had been found in the garden of Miss Scripp's home at La Jolla. These shells were not like any local snails and she believed them to be European, as some of the plants or bushes in the garden had been imported from Belgium.

This summer Mr. Allyn G. Smith of Redlands informed me that there was colony of *Helix pisana* Mull., at La Jolla and he gave me a set of shells which he had collected in December 1914. Mr. D. L. Emery of National City, has also collected from the same colony and reports them quite plentiful even though he went after them in August and had to dig them out. —E. P. CHACE.

The Nautilus.

Vol. XXIX. NOVEMBER, 1915. No. 7

A NEW INDIAN SPECIES OF PUPILLIDÆ.

BY H. A. PILSBRY.

Bifidaria (Bensonella) landurensis n. sp.

Shell rimate, the rimation like a reversed comma, conical, brownish corneous, glossy and smooth except for faint growth-striæ; the apex obtuse, whorls 5, convex, the latter part of the last whorl straightened, slowly ascending. Aperture heart-shaped, vertical, obstructed by three lamellæ upon the parietal wall, two on the columella, and four acute folds or plicæ within the outer and basal margins. Angular lamella not quite marginal, simple continuous and deeply entering; parietal lamella higher and thicker, not emerging quite so far, and also very deeply entering; infraparietal lamella quite small and short, more immersed. Columellar lamella deeply immersed, smaller than the parietal. Infracolumellar lamella small, tubercular, deep within. Plicæ all remote from the margin, the lower palatal largest, the basal, upper palatal and suprapalatal somewhat smaller, all lamellar. Peristome very narrowly expanded, having a perceptibly thickened rim within the basal and outer margins, terminating in a white tubercle above the middle of the outer lip. Above this tubercle the lip is thin and strongly arcuate. Length 2.2, diam. 1.5 mm.

Landour, India, with *B. plicidens* Bens. Type no. 16721 A. N. S. P. This species is perceptibly smaller than *B. plicidens*,

and differs from that species in the following respects: the angular lamella does not emerge quite to the edge of the peristome, and *it is continuous*, not interrupted, within. The parietal lamella is less remote from the lip-edge, emerging nearly as far as the angular. The lower palatal plica is somewhat stronger.

The only specimen seen was among specimens of *B. plicidens* (*Pupa plicidens*) received from Benson.

Bifidaria plicidens will probably prove to be one of the most widely distributed of Asiatic *Pupillidæ*. Described originally from Landour and Mussoorie, and subsequently reported from Cherra Poonjee, Assam (Godwin-Austen), it has been found by Mr. Y. Hirase at three Japanese localities—Yōrō, Mino ; Riozen, Omi ; and Suimura, Awa (Shikoku). I cannot see that the specimens show any divergence from Indian examples. I do not know that the species has been reported from China, but there cannot be much doubt that it occurs there. Dr. von Moellendorff has shown that another Japanese *Bifidaria*, *B. armigerella*, has a wide range on the Chinese mainland.

UNIO VIRIDIS CONRAD.

BY BRYANT WALKER.

The recent rediscovery by Mr. Frierson of the Appendix to Conrad's New Fresh Water Shells is a very interesting one. And in connection with it, it is also of interest to note that the "hit or miss" method in naming a species adopted by Conrad in reference to his *subviridis* has been explicitly approved by the International Commission on Zoological Nomenclature. (See Opinion 49). It seems clear that, barring the possible reference of Rafinesque's *viridis* to this species, it must be known as *subviridis* Con., with *tappanianus* Lea as a synonym.

But the identification of Rafinesque's *viridis* with the *compressa* of Lea is by no means so sure as Mr. Frierson assumes, and I desire to file an "interference", as the patent lawyers say, for the purpose of suspending the general adoption of the change

proposed until such time as certain important and probably conclusive facts can be obtained.

The recent tendency to revive the long buried names of Rafinesque without argument or explanation seems to me to be a rather regrettable one. I am quite willing to "give the devil his due", when it has been made to conclusively appear that it is his due. But to upset the accepted nomenclature of over half a century, based upon recognizable descriptions and figures, without any attempt to explain why it is done is very unfortunate and almost an abuse of bibliographic research. It is too much, at this late day, to ask the busy modern student to put aside his own work and to wallow in the Rafinesquean "Slough of Despond" in an attempt to work out for himself the reasons, which have influenced the rehabilitation of his species. While it is probably quite likely that there are some of Rafinesque's species that can be recognized, (and if they can, they should be), it is certainly not asking too much that those advocating so radical a change should in every instance give in detail the process of reasoning that has brought them to the conclusions that they have adopted. It is only in this way that those, who are willing to give a careful and candid consideration to the question and who are ready to be convinced, if the facts adduced justify the conclusion, can be expected to give any serious attention to the questions involved. There was altogether too much of the "*ipse dixit*" seventy years ago, when Say and Conrad were disagreeing with themselves and each other in their attempts to secure the recognition of Rafinesque's species, to incline any one at the present time to reopen the old controversy without having a clear, impartial and impersonal statement of facts and arguments bearing upon each species.

So far as the *viridis* of Rafinesque is concerned, I have had occasion to go over the questions involved with some care.

I have had considerable correspondence with Mr. Frierson on the subject. He has favored me with detailed statements of his reasons for identifying that species with Lea's *compressa*. I have imposed on him my reasons for questioning his conclusions. As neither of us has succeeded in convincing the other, it would seem to be a fair inference that the subject is not entirely free from doubt.

My reasons or asking a suspension of judgment in this case are, briefly, these:

1. Rafinesque states explicitly that his *viridis* was "rare in the Ohio, more common in the Kentucky and the small rivers adjacent". So far as I have been able to ascertain, no species approximating in any way to *viridis*, *compressa* or *tappanianus* has been recorded from the Ohio, the Kentucky or the small rivers adjacent. As a matter of fact, we know practically nothing of the Naiad fauna of the Kentucky, where, if anywhere, the genuine *viridis* should be rediscovered. And until the fauna of that river has been carefully investigated and it is definitely determined what species, if any, of this group is found there, it would certainly seem the "better part of wisdom" to suspend hypothetical identifications of the species.

2. The *compressa* of Lea is most emphatically a creek or small river species, ranging from western New York and Pennsylvania west to Iowa and north to the Missinaibe River in the Hudson Bay region. I have not been able to find any definite record of its occurrence in the Ohio. Dr. Ortmann, (Ann. Car. Mus., V, 1909, p. 196), states that in western Pennsylvania, it is "entirely absent in the Ohio", and, (Pr. Am. Phil. Soc., LII, 1913, p. 296), that it is "a peculiar form restricted to the tributaries of the upper Alleghany and also in French Creek and Beaver River drainage". If not found in the upper reaches of the Ohio, it is not likely that it occurs in the deeper waters of the lower pertions of the river.

The only record of its occurrence in any of the southern tributaries of the Ohio is that of Dr. Ortmann, (Pr. Am. Phil. Soc., LII, 1913, p. 372), from the little Kanawha River, which empties into the Ohio at Parkersburg.

So far as I have been able to ascertain, it has never been listed from any of the tributaries of the Ohio in Kentucky or Tennessee. Apparently, with the exception above noted, so far as our present knowledge goes, the Ohio has been a barrier to any extension of this species into its southern tributaries.

If Rafinesque's statement as to the locality of his species is to be relied upon, in view of these facts it does not seem too much to ask that the actual occurrence of *compressa* in the Ken-

tucky and small adjacent rivers be proved before any approximation of the two species be accepted.

3. The *tappanianus* of Lea, until recently, has always been considered to be restricted to the Atlantic drainage. But Dr. Ortmann, (Pr. Am. Phil. Soc., LII, 1913, p. 371), has very lately discovered it in abundance in the Greenbrier and New rivers in the upper Kanawha system. Its occurrence in the Ohio drainage system is, therefore, established.

As the habits of *compressa* and *tappanianus* are alike, both being creek species, in view of what we now know, it would seem quite as probable that *tappanianus* might be found in the Kentucky as *compressa*. At any rate, it would suggest the desirability of getting the facts as to what the fauna of the Kentucky is, before jumping at conclusions.

4. So far as I know the single valve in the Poulson collection, said to be from the Kentucky and identified by Rafinesque as his *viridis*, is not now in existence. If it is, the question as to which of the later described species it belongs, can be easily settled by an inspection of the shell. Conrad, who saw the specimen, said that it was identical with the Juniata shell described by himself as *subviridis* and by Lea as *tappanianus*. Say, who also saw the shell, said that it was an entirely different species. In the light of the then existing knowledge of the distribution of *tappanianus*, and, indeed, of our own until 1913, Dr. Lea was quite justified in his remark "that there is an error in the habitat or the name". Mr. Frierson, who has not seen the specimen, assumes that the habitat was right, but that Conrad was wrong in identifying it with the Juniata species. It would be quite as reasonable either to assume that Conrad was right and the locality wrong or that both Conrad and the locality were right. At any rate, in the absence of the specimen itself, great caution should be exercised in making any assumptions about it.

5. If Rafinesque had stated that his *viridis* came from the Atlantic drainage, there is scarcely any one, who would attempt to make any identification based on his description alone, who would not say that it was quite surely the *tappanianus* of Lea.

If the question of locality could be climinated, I feel assured,

from a very careful study of the original description in comparison with quite a large series of both *compressa* and *tappanianus*, that a strong argument could be made tending to show that, on the whole, as between these two forms, *viridis* should be approximated to *tappanianus* rather than to *compressa*. But the burden of proof is upon those, who advocate the change and until a *prima facie* case has been presented in favor of the change, there is no occasion to go into that question.

6. In view of the fact that nothing is known of the fauna of the Kentucky so far as this group is concerned, it would seem quite within the bounds of possibility that there may be a form of this group in the Kentucky, which is neither *compressa* nor *tappanianus*, but allied to the *quadrata* Lea or *diversus* Con., and which may be the real type of *viridis*. This may be a mere possibility, but even so, it emphasizes the importance of ascertaining what the fauna of that river really is.

Taking all these elements of doubt into consideration, it would seem to me that so far as the *compressa* of Lea is concerned, no change in the accepted nomenclature should be made until it can be based upon facts so conclusive as to put an end to discussion.

For the benefit of the "weak-kneed", who, like myself, hesitate to accept Mr. Frierson's conclusions, it may be well to call attention to the fact that Mr. Frierson is in error in his statement that if Rafinesque's name be not accepted, Lea's name of *compressa* must give way to the *alasmodontina* of Stimpson. Lea originally described his species as *Symphynota compressa*. The fact that an author errs in the generic reference of a new species does not prevent the use of his specific name in the genus to which the species properly belongs, provided, of course, that his name has not already been used for an earlier described species in that genus. Mr. Frierson assigns the species to *Lasmigona*, in which there is no other species described as *compressa*. It follows, therefore that the "weak-kneed" will still continue to use Lea's name for this species until it is *proved* to be a synonym of some earlier name.

MOLLUSCA OF SOUTH DAKOTA.

BY W. H. OVER.

Inasmuch as practically nothing has been published regarding the Mollusca of this State, I deem it proper to submit a list, prefaced with a few remarks in explanation of the environic conditions for shell-life as they exist today, and to some extent in the past.

During the last decade I have collected quite generally over the State, yet I realize there is much study and work to be done and in time the following list will be greatly increased. However from this locality, one would hardly expect a long list of species.

The surface of South Dakota is usually spoken of as a rolling plain, destitute of timber, except in the Black Hills and the Forest Reserves in the northwest part of the State. There is, however, considerable timber along streams locally over the State, and the eastern part is dotted over with large groves and is really in the humid district ; however, strictly speaking, only the southeastern corner is considered so. Nearly one-half of the State that lies west of the Missouri River, except the Black Hills, is considered semi-arid, and owing to the nature of the soil the surface has been eroded into deep-cut creeks and steppes, and merges into a large area of "badlands".

The average rainfall is about 14 inches in the northwestern part of the State and increases to 30 inches in the southeastern part.

The altitude in the southeastern part is about 1240 feet above sea level and increases toward the west, where at Harney Peak in the Black Hills, it is 7200 feet. However the lowest is 960 feet in the northeastern part around Bigstone Lake where a small area was probably scooped out by the glacier, and drains into the Minnesota River Valley. The balance of the State is drained by the Missouri River which nearly divides the State east and west. The eastern half is drained from north to south by the Big Sioux, Vermillion and James rivers. The western half is drained from west to east by the White, Cheyenne,

Moreau and Grand rivers. A very small portion in the northwestern part is drained by the Little Missouri River which flows north into the Missouri.

There are no lakes or ponds in the western half of the State, and the small creeks are dry most of the year. There are number of small lakes and ponds in the eastern part, formed by the glacier scooping out depressions and damming up small valleys.

The lakes, ponds and rivers east of the Missouri River abound with shell-life characteristic of the northern region. Owing to the velocity of the current and the rapid deposition of sediment, no shell-life exists in the Missouri River. For the same reason, and the presence of alkaline substances, the same is true of most of the rivers flowing into it from the west. In the north fork of the Grand River, well up toward the head in Perkins County and in the "Ft. Benton loam", I found *Anodonta grandis* and *Sphærium striatinum* var. *acuminatum*. Just east of the Black Hills, in Washabaugh County, in the Yellow Medicine Creek, I collected *Anodontoides ferussacianus* and *Sphærium sulcatum*. I think that the former may be found in several creeks in the Pine Ridge Reservation where the creek-bed is still in the "Pine Ridge loam". In fact they were reported from two other creeks by Indians whom I talked with last August, and who said they "had roasted and eaten 'em". I have found several species of very old "recent" clam shells along terraces of the first floodplain of a number of these "badland" creeks and rivers, which proves that, before the streams eroded down into the Tertiary or Cretaceous clays, they were inhabited by mussels.

The Black Hills, in the southwestern part of the State, is a dome-shaped mountain 100 miles long and 50 wide, from 5000 to 7200 feet above sea level. The higher elevations are covered with pine timber and lower down along the spring-fed creeks are deciduous trees and thickets. The rainfall is one-third more than on the surrounding plains. There are no lakes, and most of the streams are not congenial for shell-life on account of the extremely rapid current. From a collector's standpoint the Black Hills were a disappointment to me. Perhaps I expected too much. But there is a field for more work and especially

among the limestone ridges on the western slope. In the northern part of the Black Hills in Lawrence County, in Spearfish Canyon and about on the dividing line between the deciduous and pine woods, I found *Oreohelix cooperi* very abundant on Sept. 29, 1912. A light snow covered the higher elevations and the snails had hibernated; however I soon located them under leaves, brush-heaps and logs. I think this is the most eastern locality that they have been found. You will notice several species listed from the Black Hills that are identical with those found in the Rocky Mountain region. Mr. Vanatta writes that "it seems that some of the shells found in New Mexico run up the mountains into Colorado, and to the Black Hills in South Dakota." Of course the environments would be very similar.

In the eastern part of the State, the lakes or rather the natural ponds, or "sloughs" as they are locally called, seem to be the natural habitat for some of the species of *Lymnaea* and *Planorbis*. In Deuel County in the "Cotteau Hills" where these "sloughs" are numerous and shallow and practically grown up with vegetation, I have found them exceedingly abundant and of large size. Many wildducks nest here, and during migration others stop to feed, so that in season, hunting is good. I remember one small "slough" in particular, in the fall of 1916, that seemed literally full of *Lymnaea stagnalis* and *Planorbis trivolvis*, that we called "Spoonbill Slough" from the fact that this variety of duck was always to be found there. We seldom shot them, as better ducks were plentiful; but now I often regret that I did not think enough of it at the time to take a few and examine their "crops" to see if they were feeding on the young of *L. stagnalis*, which were abundant. It was also in this locality in 1908 that I found the dead specimens of *Segmentina christyi*. No live ones were there at the time, as the "slough" had been dry a year or two previous. Nor could I find them at any other pond. This was the first record for the United States, and as Mr. Bryant Walker says, "They probably came from Canada by the duck route".

(*To be concluded.*)

NOTES.

On the Genus Harmandia.—The genus *Harmandia* was proposed by Rochebrune for a couple of nearly related species of fresh-water mussels said to be from the Mekong River, Indo-China. His types were figured by Dr. F. Haas, and their resemblance to some young *Hyria* from South America was striking as the writer stated in Nautilus. Dr. Haas has critically re-examined the types, and the following excerpt from a letter from him to the writer will be of interest. "I am convinced that the genus *Harmandia* will have to disappear, being founded upon young *Hyria*. Rochebrune found the shells in the collections of Count Harmand, and Count Castelnani, both of whom were in Cochin China, as well as in Brazil." Hence the error as to the habitat.—L. S. Frierson.

Habits of Eupera.—Mr. L. S. Frierson has recently sent to me a fine set of *Eupera singleyi* (Pils.), which he collected in the Bayou Pierre, DeSoto Parish, La., with the following note :—"The willow trees send out their roots into the water and there grow about a foot long. Their rootlets convert the whole into a mat of moss-like stuff, in which these Euperas grow. They are tied to their habitat by some thread-like byssus." This is, I believe, the first record of *Eupera* in Louisiana. —Bryant Walker.

Venezuela Shells.—The following species of shells were collected by Mr. Stewardson Brown while on the Bond Venezuela Expedition in March, 1911. All the small forms were picked out of several bags of leaf mould. At Cariaquita, Venezuela he found, *Thysanophora plagioptycha* Sh., *T. bactricola* Guppy., *Strophocheilus oblongus* Müll., *Bulimulus cacticolus* Rve., *B. erectus* Rve., *Drymœus flavidus debilis* "Bk" Mart., *Opeas micra* Orb., *O. beckianus* Pfr., *O. octogyra plicatellum* Gupp, *Leptinaria lamellata* P. & M., *L. simplex* Guppy, *Streptaxis deformis* Fer., *Polita implicans* Guppy, *Ernstia ernsti* Jouss., *Guppya gundlachi* Pfr., *G. semenlini* Moric, *Radiodiscus millecostata* Pils.,

Succinea tamsiana Pfr., *Aperostoma rugatus* Guppy, *Diplommatina huttoni occidentale* Guppy, *Helicina nemoralis* Guppy, *H. dysoni* Pfr. and *Lucidella lirata* Pfr.

On a hillside on the East side of the Bay near Cariaquita on the North shore of the Gulf of Paria, Venezuela, Mr. Brown collected *Auris distortus sublaevis* Pils, *Bulimulus cacticolus* Rve., *Drymæus flavidus debilis* "Bk." Mart., *Subulina octona strebeli* v. Mart., *Caecilioides consobrina minutissima* Guppy, *Leptinaria lamellata* P. & M., *Streptaxis deformis* Per., *Guppya gundlachi* Pfr., *Aperostoma translucidum* Sby., *Helicina dysoni* Pfr. and *Lucidella lirata* Pfr. *Oxystyla varia* v. Mart. was taken at Pedernales, *Ampullaria glauca* L., *A. columbiensis* "Sby." Phil. & *A. metcalfei* Rve. were collected in the Manimo River and *Ampullaria glauca* L. and *A. urceus* Müll., in the Rio Vagre.—E. G. Vanatta.

Helix hortensis, near Edgartown, Martha's Vineyard, Mass.—This species has recently been found by Mr. Edward Wigglesworth, on Snow's Point, Chappaquiddic Island, near Edgartown. The species was recorded from near Gay Head, by John H. Thomson in 1885, (Journ. Conch. [Brit.] IV, p. 373), but I have been unable to obtain a record of the species from Martha's Vineyard since that time. Thomson's specimens were all of the bright lemon-yellow variety, while this colony contains practically only the five-banded form. In only four specimens out of 97 was the third band wanting and of these two were young (under 7mm.), in 12 other young specimens however the third band was the first to appear. In about six specimens there was a tendency for the first and second and the fourth and fifth bands to fuse on the outer portion of the body-whorl.—C. W. Johnson.

Slugs in California.—While in California last August I made a few notes on two species of introduced slugs, as follows:

Limax flavus L. Abundant on dry rocks, Sunset Boulevard, Los Angeles. Tentacles grey-blue; mantle and body very dark

brown, the usual pale markings *white* (no yellow); sole pale grey with a slight yellowish tint. All were alike. In the colorless slime this agrees with var. *grisea* Roebuck, but the color and markings of the skin are those of var. *umbrosa* Philippi. Is the loss of the yellow color due to the peculiar environment?

Limax maximus L. At Berkeley I obtained a very fine spotted form; mantle with many black spots; body pale grey, slightly reddish laterally, with four rows of black spots, and at sides irregular small black spots. The dorsal spots are elongated, and the animal is referable to the variety *cellaria*.

T. D. A. Cockerell.

Tethys (*Neaplysia*) *californica* (Cooper).—Last August, when my wife and I were at La Jolla, California, we obtained six living specimens of this species. The largest was ten inches long, and four high, counting the parapodial lobes. The animals exuded a deep purple substance, which soon turned brown. The following description of the color is from life: body rather coffee brown, marbled with dull crimson and thickly sprinkled with large, mostly circular, dark brown or almost black spots, irregularly placed and of different sizes; there is also a fine dark reticulation. Inner side of parapodial lobes heavily barred with brown-black and whitish, the dark color much more extensive than the pale. Sole dark purplish brown, much wrinkled. There is variation in the size of the dark spots and the distinctness of the crimson markings, which may be very obscure. This appears to be quite distinct from *T. ritteri* Ckll., and I was informed that the biologists of the Scripps Institution were familiar with a second, less-marked, species, which doubtless is *T. ritteri*.—T. D. A. Cockerell.

The Solenopsidae. The extinct family Solenopsidæ has for its type genus *Solenopsis* McCoy, the name of which, being preoccupied, was altered to *Solenomorpha* in 1903 (Nature, April 16, p. 559). The family name has however continued in use, so it may be well to point out that it must be altered to *Solenomorphidæ*.—T. D. A. Cockerell.

The Nautilus.

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AN OCCURRENCE OF PALUDESTRINA SALSA IN NEW JERSEY.

BY BAYARD LONG.

The rapid extermination of the native flora along the New Jersey coast, through the so-called "improvements" in real estate, has led me during a period of some years to endeavor, as opportunity arose, to make as complete a survey as possible of the plants of Long Beach. (This is a long narrow island lying midway in the ocean boundary of New Jersey. Beach Haven, its best known summer resort, is probably the most familiar name associated with this twenty miles of coast.) When grading was accomplished mostly by the destruction and leveling of the sand dunes, much of the brackish marsh area escaped serious disturbance, but with the introduction of the suction-dredge even the salt marshes, with their flora and fauna, soon disappear under the flooding sand.

With this thought in mind, whenever I am collecting plants in the vicinity of Tucker's, I make a point of visiting a certain deep brackish pond-hole in the midst of the salt marshes. My interest lies in the endeavor to find fruit on the *Ruppia* which fills this pool. The several forms of this water-plant are distinguished mainly upon fruit characters, and the present colony seems to consistently spend its energies vegetatively.

In the autumn of 1914 in picking over handfuls of this *Ruppia* in hopes of finding a fruiting strand or old fruit entangled among the leaves, I found a small Amnicoloid snail (the size of a *Ruppia* fruit). On hasty examination it some-

what resembled *Lyogyrus granum*, with which I had become familiar in the Delaware River tidal marshes, living upon water-plants of the same group. Suspecting it might be of some interest, it was submitted to Mr. E. G. Vanatta, and though the shell was deformed, he pronounced it to be *Paludestrina salsa* Pilsbry.

As this formed a rather considerable southerly extension of range of this little-known shell, a more satisfactory basis for the new record was established August 5, 1915, when a good series was obtained. The snail proved to be much more common upon floating algal vegetation than upon the *Ruppia*, and the amount of material obtained depended only upon the quantity of algae picked over. This appears to be a thriving colony as individuals in all stages of development were equally common. Some slight variation seems to occur, as seen in mature examples, but this is apparently no greater, nor of any more significance, than previously noted in this species.[1]

The pond-hole where this colony of *Paludestrina salsa* occurs is rather unique among the physical features of Long Beach. Most of the pieces of brackish water on the salt marshes here are merely shallow, muddy depressions of irregular outline, but the present one is a deep round pool of no great area with precipitous sides. If it occurred in rocky country it would probably be referred to as a pot-hole or a sink-hole.

In looking up the literature of the described localities where this snail has been observed, I find in the interesting accounts which Rev. H. W. Winkley gives of the various habitats known to him, that there are references which very closely suggest the Long Beach station. In Branford, Connecticut, the snail is described as abundant on vegetable matter floating in a ditch in the brackish marsh (to combine information from two notes).[2] In the later paper there is also reference to the station in Wareham, Massachusetts where a colony occurs "in a pot hole in the marsh." I have no doubt that in physical features the Long Beach locality much resembles the one in Wareham. If

[1] Winkley, Nautilus, xix, 107 (1906).

[2] Winkley, Nautilus, xix, 107 (1906) and xxii, 53 (1908).

the snail here also occurs on floating vegetation the similarity would be very striking.

This colony near Tucker's, Long Beach Island, Ocean County New Jersey extends the range of *Paludestrina salsa* southward, to the best of my knowledge, from Branford, Connecticut, which is near New Haven—an extension of considerably over a hundred miles.

My material, critically examined by Mr. E. G. Vanatta, is deposited at the Academy of Natural Science of Philadelphia.

PLEISTOCENE MOLLUSKS FROM ILLINOIS.

BY FRANK C. BAKER.

Early in the year the Page Engineering Company of Chicago submitted to the writer some specimens of mollusks and moss obtained from a cutting near the Fox River, one mile east of Cary Station. The sequence of deposits is as follows :

1. Black earth . . .	2 feet	6 inches
2. Brown earth . . .	2 "	6 inches
3. Marl.	4 "	
4. Moss	2 "	
5. Marl.	2 "	
Height of section . .	13 "	

Eight species of mollusks were picked from the marl, No. 3.

Valvata tricarinata Say.
Valvata lewisii Currier.
Amnicola lustrica Pilsbry.
Amnicola limosa Say.
Planorbis parvus Say.
Planorbis exacutus Say.
Galba galbana Say.
Physa species (fragments).

The moss was submitted to Doctor Edward W. Berry, Johns Hopkins University, who determined it to be "*Plagiothecium denticulatum* (Linné) B. and S., probably near the subspecies *rosaceum* (Hampe) B. and S." Occurring as this thick moss

bed does between two strata of marl, it arouses considerable interest as to the method of its formation and also that of the bed of marl above and below the moss. Professor Berry says of this species "this moss is very common and wide-spread in middle latitudes and may possibly be a composite form. It grows in various moist (not necessarily swamp) situations from the Atlantic to the Pacific."

The deposits are all post-glacial and probably represent fluctuations in a water body, possibly connected with the Fox River Valley. The thickness of the moss (two feet) suggests a comparatively long period of swampy condition between two pond formations. The mollusks are indicative of a water body four to eight feet in depth. Samples were not secured of the marl beneath the moss, which probably also contained mollusks.

The whole Fox River Valley is worthy of study, the lower part of the river bank bearing strata belonging to the Sangamon or Post-Illinoian interglacial interval, which are fossil-bearing. In view of the rich beds of molluscan fossils found near Chicago, it would seem that these Fox River strata should be investigated, as they may also contain remains of life indicating something of the migration of life during this interesting interval, when the great shell beds of Toronto were formed.

The New York State College of Forestry.
Syracuse University.

THE GASTROPODA OF PAYNE COUNTY, OKLAHOMA.

BY DARLING K. GREGER, COLUMBIA, MISSOURI.

The collection upon which the list of species given below is based was made in the month of May, during a season of abnormally wet weather. While we covered practically the whole of Payne county, the region between Wild Horse and Stillwater creeks and from the Cimarron River north to the town of Stillwater was studied quite thoroughly during the period of our stay.

Of the nine families represented in the region, the *Helicidæ*

and *Pupillidæ* are the most prolific of the land forms. The *Pupillidæ* represented by five species, are by far the most abundant of the land forms, *Bifidaria procera* and *cristata* occurring in colonies of hundreds. *Bifidaria contracta* Say, however is quite rare, being known only from a few specimens taken from the stomach of a lizard.

Among the specimens of the *Zonitidæ*, *Vitrea indentata* Say and *Zonitoides aborea* Say are very plentiful in suitable spots, while *Euconulus fulvus* Drap. is rare, although the latter is adapted to like environment in other regions. *Succinea avara* Say is very abundant along the margins of small streams and ponds where the soil is damp and well shaded.

Following each species we have given measurements of the average sized, mature shells from the various stations in which we collected in the county. These measurements may be accepted as representing the size acquired by each species in this particular region of Oklahoma.

Helicidæ.

Polygyra monodon Rack. Alt. 5.2 mm., diam. 8.5 mm.
Polygyra texasiana Moric. Alt. 4.3 mm., diam. 9.3 mm.
Polygyra texasiana var. Alt. 5.2 mm., diam. 11.7 mm.

Pupillidæ.

Bifidaria armifera Say. Alt. 4.6 mm., diam. 2.8 mm.
Bifidaria contracta Say. Alt. 2.6 mm., diam. 1.4 mm.
Bifidaria procera Gld.
Bifidaria p. cristata P. & V. Alt. 2.8 mm., diam. 1.2 mm.
Pupoides marginatus Say. Alt. 4.8 mm., diam. 2.0 mm.
Strobilops labyrinthica Say. Alt. 2.2 mm., diam. 2.4 mm.
Vertigo ovata Say.

Zonitidæ.

Euconulus fulvus Drap. Alt. 2.9 mm., diam. 2.8 mm.
Vitrea indentata Say. Alt. 2.1 mm., diam. 6.0 mm.
Zonitoides arborea Say. Alt. 1.9 mm., diam. 4.5 mm.
Zonitoides minuscula Binn. Alt. 0.9 mm., diam. 2.1 mm.

Limacidæ.

Agriolimax agrestis Linn.

Endodontidæ.

Helicodiscus parallelus Say. Alt. 1.4 mm., diam. 4.7 mm.

Succinidæ.

Succinea avara Say. Alt. 12.1 mm., diam. 6.4 mm.

Succinea grosvenor Lea.

Limnæidæ.

Lymnæa cubensis Pfr. Alt. 11.8 mm., diam 6.6 mm.

Planorbis antrosus Conr. (*bicarinatus* Say). Alt. 4.9 mm., diam. 9.9 mm.

Planorbis parvus Say. Alt. 1.0 mm., diam. 4.0 mm.

Planorbis trivolvis Say. Alt. 7.3 mm., diam. 19.5 mm.

Physidæ.

Physa gyrina Say. Alt. 14.7 mm. diam. 7.6 mm.

Amnicolidæ.

Amnicola cincinnatiensis Anth. Alt. 4.7 mm., diam. 3.2 mm.

In this connection it may be mentioned that while gastropods are abundant in the ponds, small creeks and the larger streams tributary to the Cimarron, not a single form of molluscan life was found in the Cimarron River, in Payne county, although the dredge was used at frequent intervals along a stretch of fifteen miles.

MOLLUSCA OF SOUTH DAKOTA.

BY W. H. OVER.

(*Concluded from page* 81).

All species listed were collected by me and are in my private collection of land and freshwater Mollusca now on exhibition in the Museum of the University of South Dakota.

For the determination of species I am grateful to Messrs H. A. Pilsbry, E. G. Vanatta, Bryant Walker, Dr. Sterki, L. S. Frierson, F. C. Baker and A. A. Hinkley. But for the latter I probably never would have become interested in the study and collecting of shells.

Vallonia costata Müll. Deuel Co.

Vallonia pulchella Müll. Deuel Co.

Vallonia parvula Sterki. Clay, Deuel and Brule Counties.

Vallonia gracilicosta Reinh. Common over the State.

Vallonia perspectiva Sterki. Deuel Co.

Oreohelix cooperi W. G. B. Spearfish Canyon, Lawrence Co.

Polygyra monodon Rack. Woods along Vermilion River, Clay Co.

Pupoides marginatus Say. Common in the semi-arid districts. Also Clay Co.

Pupoides inornatus Vanatta. Type lot from drift along White River, Washington Co. Also collected along Indian Creek, eastern Pennington Co.

Bifidaria tappaniana Ads. Clay and Deuel Counties.

Bifidaria clappi Sterki. Pennington Co.

Bifidaria holzingeri Sterki. One specimen taken in woods along Spearfish Creek in Lawrence Co.

Bifidaria agna Pils. and Van. Quite general over the State.

Bifidaria contracta Say. Clay Co.

Bifidaria procera Gld. All through the southern part of State.

Bifidaria armifera Say. Common over the State.

Bifidaria armifera abbreviata Sterki. Perkins Co.

Bifidaria pentodon Say. Over the State.

Pupilla muscorum L. Washington Co.

Pupilla blandi Morse. Pennington and Brule Counties.

Vertigo ovata Say. Deuel and Clay Counties. Probably common in eastern part of State.

Vertigo milium Gld. Found in drift along Missouri River at Chamberlain, Brule Co.

Cochlicopa lubrica Müll. Clay, Lawrence and Deuel Counties.

Vitrina alaskana Dall. Lawrence Co.

Polita hammonis Ström. Clay, Deuel and Pennington Counties.

Euconulus fulvus Müll. Pennington, Lawrence, Harding and Deuel Counties.

Zonitoides arborea Say. Locally over the State.

Zonitoides minuscula Binn. Common over the State.

Zonitoides nitida Müll. Clay, Deuel and Washabaugh Counties.

Zonitoides singleyana Pils. Brule, Clay and Custer Counties.

Agriolimax campestris Binn. Harding Co. Probably in eastern part of State.

Pyramidula alternata Say. Clay Co.

Pyramidula cronkhitei Newc. Deuel Co.

Pyramidula cronkhitei anthonyi Pils. Clay, Pennington and Lawrence Counties.

Helicodiscus parallelus Say. Clay, Washington, Deuel and Brule Counties.

Punctum pygmæum Drap. Deuel and Lawrence Counties.

Punctum californicum Pils. Clay Co.

Succinea nuttalliana Say. Deuel Co.

Succinea higginsi Gld. Deuel Co.

Succinea avara Say. Common over the State.

Succinea grosvenorii Lea. Common over the plains and prairies.

Carychium exile H. C. Lea. Stanley Co.

Carychium exiguum Say. Clay and Deuel Counties.

Lymnæa elodes Say. Clay Co.

Lymnæa tryoni Lea. Deuel Co.

Lymnæa obrussa Say. Black Hills.

Lymnæa palustris Mull. Generally distributed over the State.

Lymnæa palustris michiganensis Walker. Deuel Co.

Lymnæa parva Lea. Perkins and Deuel Counties.

Lymnæa caperata Say. Common over the State.

Lymnæa humilis modicella Say. Deuel, Clay, Butte, Perkins and Harding Counties.

Lymnæa stagnalis appressa Say. Deuel Co. Probably over eastern part of State.

Lymnæa cockerelli Pils. and Ferr. Over the State.

Lymnæa techella Hald. Harding Co.

Physa sayi Tapp. Perkins, Deuel and Harding Counties.

Physa ancillaria Say. Codington Co.

Physa humerosa Gld. Spink Co.

Physa crandalli Baker. Fish ponds at hatchery, Lawrence Co.

Physa walkeri Crandall (?) Spink Co. Turtle River.

Physa integra Hald. Rare over the State.

Physa gyrina Say. Abundant over the State.

Aplexa hypnorum L. Deuel Co.

Planorbis umbilicatellus Ckll. Perkins Co.

Planorbis antrosus Conrad. Locally found over the State. Reported by Audubon in 1840 from Missouri River. Probably at mouth of some creek flowing in from the east.

Planorbis parvus Say. Deuel, Pennington, Clap and Harding Counties.

Planorbis exacuus Say. Deuel Co. near Altimont.

Planorbis trivolvis Say. Quite common over the State. Also collected in Beadle Co. in 1895 by S. F. Adams.

Planorbis deflectus Say. Clay, Perkins, Deuel, Washington and Washabaugh Counties.

Planorbis tumidus Pfr. Perkins and Deuel Counties.

Segmentina armigera Say. Clay and Deuel Counties.

Segmentina christyi Dall. Dead shells were abundant at a small pond in Deuel Co. in 1908.

Ancylus parallelus Hald. Deuel Co.

Valvata tricarinata Say. Codington, Clay and Deuel Counties.

Campeloma integrum Say. Clay Co. Vermilion River. One sinistral.

Somatogyrus subglobosus Say. Deuel Co.

Somatogyrus integer Say. Deuel Co.

Amnicola cincinnatiensis Anth. Spink Co. Turtle River.

Amnicola limosa Say. Codington and Clay Counties.

Amnicola emarginata Küst. Codington and Clay Counties.

Lampsilis luteolus Lam. Clay, Deuel, Codington and Spink Counties. One "dead" specimen was found in the Little Missouri River in Harding Co. It is doubtful if it exists there at present, but may be found in the same river at higher elevation and in a sandy loam formation in Montana.

Lampsilis ventricosus Barnes.

Lampsilis lævissimus Lea.

Lampsilis alatus Say.

Lampsilis parvus Barnes. Vermillion River, Clay Co.

Lampsilis gracilis Barnes. The above five species are no doubt more or less common in the Big Sioux, Vermilion and James Rivers.

Lampsilis anodontoides Lea. Clay Co.

Lampsilis subrostratus Say. Rare in Brule Creek, Union County.

Lampsilis rectus Lamk. Brule Creek, Union Co.

Plagiola elegans Lea. Clay Co.

Strophitus edentulus Say. Lake Kampeska, Codington Co.

Strophitus edentulus pavonius Lea. Hidewood Creek, Deuel Co.

Anodonta dakota Frierson. Clear Lake, Deuel Co.

Anodonta grandis Say. Perkins, Deuel, Spink, Clay and Codington Counties.

Anodonta grandis footiana Lea. Deuel and Codington Counties.

Anodonta grandis gigantea Lea. Deuel Co.

Anodontoides ferussacianus Lea. Washabaugh and Deuel Counties.

Anodontoides ferussacianus subcylindraceus Lea. Deuel Co.

Symphynota compressa Lea. Deuel Co.

Symphynota complanata Barnes. Clay and Deuel Counties.

Symphynota complanata katherina Lea. Lake Kampeska, Codington Co.

Arcidens confragosus Say. Clay Co.

Quadrula lachrymosa Lea. Clay Co.

Quadrula pustulosa Lea.

Quadrula undulata Barnes. Deuel, Clay and Spink Counties.

Sphærium sulcatum Lam. Washabaugh and Deuel Counties.

Sphærium rhomboideum Say. Hidewood Creek, Deuel Co.

Sphærium simile Say. Deuel Co.

Sphærium stramineum Conr. Lake Kampeska, Codington Co.

Sphærium striatinum Lam. Deuel Co.

Sphærium striatinum acuminatum Prime. Ziebach, Harding, Perkins and Butte Counties.

Musculium partumeium Say. Deuel Co.

Musculium secure Prime. Pennington and Perkins Counties.

Musculium jayense Prime. Ziebach, Perkins and Deuel Counties.

Pisidium contortum Prime. Harding Co.

Pisidium mainense Sterki. (or near) Deuel Co.

Pisidium affine Sterki. Deuel Co.

Pisidium subrotundum Sterki. Pennington Co.

Pisidium abditum Hald. Pennington and Washington Counties.

Pisidium variabile Prime. Washabaugh Co.

Pisidium kirklandi Sterki. Deuel Co.

Pisidium compressum Prime. Deuel Co.

Pisidium compressum lævigatum Sterki. Deuel Co.

Pisidium sargentii Sterki. Deuel Co.

Pisidium overi Sterki. Deep waterhole in creek one half mile south of Clear Lake, Deuel Co.

Pisidium walkeri Sterki. Hidewood Creek, Deuel Co.

Pisidium pauperculum crystalense Sterki. Deuel Co.

The following post-glacial fossils, Wisconsin drift, were taken from a well 20 feet beneath the surface, 3 miles north of Grandview, Douglas Co., in 1883 by Prof. J. E. Todd, at that time State Geologist. The specimens were identified by Frank C. Baker.

Pisidium compressum Prime.
Pisidium variabile Prime.
Pisidium medianum Sterki (?)
Valvata tricarinata Say.
Valvata lewisii Currier.
Succinea avara Say.
Physa sp. (immature)
Lymnaea (Galba) palustris Mull.
Lymnaea stagnalis appressa Say.
Planorbis trivolvis Say.
Planorbis bicarinatus Say. (*antrosus* Conrad)
Planorbis antrosus striatus Baker.
Planorbis deflectus Say.
Planorbis parvus Say.
Planorbis exacutus Say.

PUPOIDES INORNATUS N. SP.

E. G. VANATTA.

Shell small, cylindrical, rimate; apex obtusely rounded, white; the lower part of the shell opaque flesh colored; surface with a few irregular growth striæ; suture impressed, ascending at the aperture; whorls 5¼, convex, slightly shouldered below the suture; base obtusely angular. Aperture more than one-third the height of the shell; oval, truncate, without lamellæ or plicæ; parietal callus transparent; lip and columella opaque, white, thick, broadly reflexed. Alt. 3.61, diam. 1.37, apert. alt. 1.30, diam. 1.07 mm.

Type in the collection of the Academy of Natural Sciences,

number 110977, in drift of White River, central Washington Co., S. Dakota, collected by Mr. W. H. Over, August, 1914. Associated with *Pupilla muscorum* L., *P. blandi* Mse., *Bifidaria procera* Gld., *B. agna* P. & V., *B. pentodon* Say, *B. armifera* Say, *Vallonia gracilicosta* Reinh. and *Succinea avara* Say. Also in the Academy's collection from drift along Indian Creek, Pennington Co., S. D. (W. H. Over, viii, 24, 1914); Pike's Peak, Colo. (E. Hall); Trinidad, Colo. (Dr. H. A. Pilsbry, 1906); ant hills, near Four Mile Hill, and charcoal zone near Arroyo Pecos, Las Vegas, New Mexico (T. D. A. Cockerell, 1900).

This species differs from *P. hordaceus* Gabb by its smooth surface; *P. chordatus* Pfr. is narrower, thinner, and has a tooth at angle of aperture; *P. paradesii* Orb. is costate and more tapering.

NOTES.

Littorina littorea a Fish.—In the case Leavitt *vs.* Clarke in the Divisional Court, in London, Eng., on May 7th, 1915, the question arose as to whether a winkle is a fish. The appeal was brought from a sentence under the Larceny Act, 1861, which makes it illegal for a person to take or destroy fish from private water.

The Lord Chief Justice, Lord Reading, confessed he was puzzled as to whether a winkle could be called a fish, but, following the decision in Caygill *vs.* Thwaite (1885) that cray fish were fish, he considered that the appeal must be dismissed. Mr. Justice Avory agreed on the ground that for thirty years the law had been thought to be laid down in the case cited. Mr. Justice Low said that he saw no reason why a winkle should not be called a fish!—F. R. Latchford.

Mr. Frank C. Baker, formerly Acting Director of the Chicago Academy of Science, is at present engaged on ecological work in the School of Forestry, Syracuse University.

The Nautilus.

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HELICES OF LOWER CALIFORNIA AND SINALOA.

BY H. A. PILSBRY.

In my "Notes upon some Lower Californian Helices," Proc. Acad. Nat. Sci. Phila. 1913, descriptions and figures were given of the Helices of the west coast and coastal islands of the peninsula. The inland group remains to be considered here.[1]

While it seems likely that some or all of the Lower Californian mountain Helices will prove to belong to the section *Eremarionta* of the genus *Micrarionta*, yet none are known anatomically, and we have as yet no way to tell them by the shells alone from *Sonorella*. It seems best therefore to refer all *Sonorella*-like shells of the Southwest to that genus until they are proved to belong elsewhere by dissection of the animal.

Group of Sonorella lohrii.

Helices of this group are much depressed, with a broadly open umbilicus, more or less overhung by the dilated columellar lip. They have the color and texture of *Sonorella*.

[1] In the paper just mentioned, I ranked *Helix canescens* Adams and Reeve as a subspecies of *Micrarionta veatchii* (p. 386). This was of course an oversight, since *H. canescens* was described first. It will probably be best to leave both stand as species until their intergradation is demonstrated; but if they *do* intergrade, then *veatchii* will take the trinomial.

SONORELLA LOHRII (Gabb). Pl. 2, fig. 8.

Helix lohrii GABB. American Journal of Conchology, III, p. 236, pl. 16, fig. 2 (1867) ; IV, p. 235 (1868).

Sonorella lohrii Gabb, PILSBRY, Proc. A. N. S. Phila. 1900, p. 560 (1901). BARTSCH, Smiths. Misc. Coll., vol. 47, p. 197, pl. 32, fig. 1 (1904).

Helix steganella Mabille, 1895. See below.

The prominent features of this species are the very minutely granulated surface, the large nuclear whorl and small number of whorls, the position of the periphery, which is above the middle, very obtusely angular in front, the surface below it being rather flattened and sloping inward. The peristome is somewhat bell-shaped, flaring, reflexed outwardly and below. The type (No. 58106 A. N. S. P.) measures, height 10, diam. 22.1 mm. ; width of umbilicus 4 mm. ; width of aperture 13, height 11.1 mm.

Dr. Bartsch has given excellent figures of this species, but for ready comparison with the others I have figured the type specimen here.

S. lohrii comes "from the higher table lands near Moleje."

SONORELLA LIODERMA Pilsbry. Pl. 2, fig. 7.

Sonorella lohrii lioderma PILS., NAUTILUS XVIII, p. 59 (1904).

The shell is depressed with very low spire and broadly open umbilicus, contained about five times in the diameter of the shell ; very glossy, smooth except for fine growth-lines ; whorls $4\frac{1}{2}$, convex, slowly increasing to the last which widens rapidly, is rounded at the periphery, and descends rather deeply in front. The aperture is strongly oblique, transversely ovate. Peristome expanded and reflexed throughout, the margins strongly converging and joined by a thin, short parietal callous, the columellar margin dilated, overhanging a small part of the umbilicus. Height 10, diam. 21.8 mm. ; width of umbilicus 4.2 mm. ; aperture 13.3 mm. wide, 11.1 high (including peristome).

This shell was originally described as a subspecies of *S. lohrii*, but it is evidently distinct. It differs by the entire absence of granulation, the equally rounded periphery, less deeply im-

pressed suture, by having a much smaller embryonic whorl, a more transversely lengthened aperture with shorter parietal callus; and by the more arched and more reflexed upper margin of the peristome. As the original description was rather brief and unillustrated, figures of the type are now given.

S. lioderma was collected by Gabb. It was one of the specimens formerly in the tray with his type of *H. lohrii*, and presumably was found in the same district. The type is No. 58107 A. N. S. P. I cannot identify it with any of the species described by Mabille.

The following species evidently belong to the group of *S. lohrii*, since all are described as "*broadly and perviously umbilicate*". Their other chief characters are given below, abbreviated from Mabille's descriptions, as the original publication is probably not accessible to many West Coast conchologists. None of them were figured, and no comparisons with other species are given.

Helix indigena J. Mabille. Depressed-subdiscoidal, solid, subpellucid, somewhat glossy, above planulate, reddish-corneous with a brown zone bordered by white zones, white beneath; beautifully rib-striate; apex obtuse, minute, striate; whorls 5, the last rounded, descending a little to the aperture; base a little inflated, especially around the umbilicus. Peristome a little dilated, scarcely reflexed, the margins converging, joined by a scarcely noticeable callus. Diam. 19 to 21, alt. 7 to 8 mm. Only found above 800 meters on the peaks of the Sierra, throughout most of the central part of the Peninsula of California (Bulletin de la Société Philomathique de Paris, 8th Ser., vii, 1895, p. 64).

This seems from the description to be a distinct species, differing from *S. lioderma* by the sculpture and the less developed peristome.

Helix steganella J. Mabille. Depressed, destitute of color and cuticle but with a reddish zone, rather thick, solid; irregularly striate, and densely covered with many minute granules arranged in oblique series. Spire slightly prominent, the apex costulate, obtuse. Whorls 4, the last strongly dilated and shortly descending at the aperture, a little excavated above at the suture, obscurely angular at the periphery, slopingly compressed below the periphery, inflated around the umbilicus. Peristome thickened, spreading, a little reflexed, the converging margins joined

by a very thin callus ; the outer margin at first rather straight, scarcely reflexed, then carved, basal margin nearly straight, reflexed. Umbilical margin dilated, thickened, slightly covering the umbilicus. Diam. 21 to 29, alt. 7½ to 8 mm. Same localities (Same reference).

The description of this species applies very well to *H. lohrii* Gabb. I think it a synonym of that species.

Helix invecta J. Mabille. Depressed-orbiculate, without cuticle or color, but with traces of a brownish line above ; solid, rather thick, coarsely striatulate and under a lens beautifully striatulate. Whorls 4, the last angular at periphery, rather swollen below, at the aperture dilated and slightly descending. Peristome expanded, slightly thickened, the approaching margins joined by a rather thick callus ; columellar margin dilated in a triangular plate over the umbilicus. Diam. 21, alt. 7 mm. Lower California (same reference, p. 65).

Seems nearer *S. lohrii* than any other species I have seen.

Helix digueti J. Mabille. Subdepressed, without color or cuticle, solid, subopaque, irregularly and densely costulate-striate, apex nearly smooth, whorls 4, the last slightly dilated and shortly descending to the aperture. Peristome reflexed, margins joined by a very thin callous, columellar margin dilated, nearly covering the umbilicus. Diam. 20 to 20½, alt. 8 to 9 mm. No locality mentioned (same reference, p. 65).

I have seen no species answering to the description of this.

Group of S. hachitana.

Sonorella merrilli Bartsch (1904). Below San Quentin, L. Cal.

The surface has "very dense, exceedingly minute granulations, both on the upper and the lower surface." Height 12.5, diam. 22, umbilicus about 4 mm.

Sonorella peninsularis n. sp. Pl. 2, figs. 4.

The shell is umbilicate (the width of umbilicus contained between eight and nine times in the diameter of the shell), moderately depressed, the spire low-conic ; pale cinnamon with a few white streaks, having a chestnut-brown band above the periphery, margined narrowly with whitish above, more widely below ; whitish around the umbilicus. The surface is glossy, lightly marked with growth-lines, and in some places above the

periphery of the last whorl some excessively faint spiral lines may be seen under a hand-lens. The first whorl begins with irregular radial ripples, then is very minutely rugose with inconspicuous rounded papillæ, widely spaced, and arranged in forwardly descending, curved series. Whorls 5, rather convex, those of the spire rather narrowly coiled, the last rapidly enlarging, descending somewhat to the aperture. The aperture is large and decidedly oblique. The peristome is thin, the upper and outer margins narrowly expanding, basal margin narrowly reflexed ; the columellar margin runs rather far forward, and is much dilated at the insertion, the external edge straightened.

Height 15, diam. 22 mm. ; umbilicus 2.6 mm.

Locality.— Trinidad, on the west coast, near San Borga. Wm. M. Gabb. Type no. 58127 A. N. S. P.

I have not been able to locate Trinidad on the map. San Borgia is a mission in the interior, below the 29th parallel. There are several other specimens in the collection, all taken by Gabb.

This is one of several forms which W. M. Gabb determined as *Helix carpenteri* Newc.—a Californian species which differs by its "numerous very minute spiral striations". *Sonorella merrilli* Bartsch is more depressed, with a smaller aperture and larger umbilicus. The several species described from the peninsula by M. Jules Mabille differ in proportions from this one.

Sonorella ultima n. sp. Pl. 2, fig. 5.

The shell is narrowly umbilicate (the width of the umbilicus contained about twelve times in the diameter of shell); rather thin ; depressed-globose, with very low conic spire ; pale cinnamon, fading to opaque white on the base, having a chestnut-brown band above the periphery. The surface is glossy, weakly marked with growth-lines, without spiral striation. Whorls $4\frac{1}{2}$, moderately convex, those of the spire slowly increasing, the last whorl very wide, deflexed in front. The aperture is large, oblique. Peristome thin at the edge, but having a rather wide low white callous rim within, the terminations strongly converging ; the upper margin is unexpanded, outer and basal margins narrowly expanded ; columellar margin carried forward, straight-

ened outwardly, broadly dilated at the insertion, partly covering the umbilicus; parietal film transparent but not very thin.

Height 12.7, diam. 20 mm. Aperture with peristome 12.7 mm. wide; umbilicus 1.7 mm. wide.

Locality.—Sinaloa, Mexico, Wm. M. Gabb. Type No. 58124 A. N. S. P.

The special features of this species are its narrow umbilicus, very wide last whorl, large aperture and surface free from any trace of spiral incised lines. The apex is slightly worn, but I think I see traces of the same sculpture described for the first whorl of *S. peninsularis.* It is one of the specimens Gabb identified as *Helix rémondi* Tryon—which is quite a different thing. Gabb was a really notable geological explorer, but sometimes he was not fussy over identifications of shells.

EPIPHRAGMOPHORA ELLIPSOSTOMA Pilsbry. Pl. 2, figs. 6.

Described in NAUTILUS VIII, p. 81 (1894), but not figured before. The locality given by Gabb, San Juan del Norte, is rather ambiguous. It would be taken for the place so named in Nicaragua were it not that the specimen was stuck on a label with a shell of *Sonorella peninsularis*, suggesting a Lower Californian habitat. The malleation and epidermis recall Californian and Peruvian Helices, but no similar species has been taken in Nicaragua. The figures represent the type-specimen, no. 10745 A. N. S. P.

OBSERVATIONS ON THE UNIO COR, OF CONRAD.

BY L. S. FRIERSON.

T. A. Conrad published in 1834, his "New Fresh Water Shells" describing and figuring a number of species. His figures were not very good, and some confusion ever since has been the result. For instance, his figure of *U. prasinus* is so unlike the fignre given by Dr. Lea for his *U. schoolcrafti* that the two have been placed as different sub-species in our lists; yet both figures were drawn from the same identical specimen! Mr. Conrad figured a shell, (presumably his *Unio stramineus*) on plate 7, but he omitted it altogether from the text!

But above all, the confusion concerning his *Unio cor* is the greatest, for there is not the slightest doubt that Mr. Conrad described one species, and figured an entirely different one under this name!

Through the kindness of Mr. E. C. Vanatta, of the Academy of Natural Sciences, this confusion has been cleared up.

Mr. Conrad published, in January 1834, a shell he called *Unio mytilloides* (Am. Jl. Sci. xxv, pl. 1, fig. 7), and his figure of *Unio cor* (New Fresh Water Shells, plate iii, fig. 3) in May, 1834. These figures were assumed by Mr. C. T. Simpson, to represent the same species. There is little doubt but that the "Mytilloides" figured is a *Unio ebenus* Lea, and the figure of *cor*, is much like it, yet not identical.

No shell exactly like Conrad's *cor* has yet been obtainable, and if the figure is accurate, the species is probably yet undescribed.

The true *Cor*, however, is well characterized, and the type, in the collection of the Academy of Natural Sciences, is figured herewith (pl. iii, figs. 1, 2, 3) through the courtesy of Dr. Pilsbry.[1]

U. cor Conrad is a native of the Elk and Flint Rivers. These are tributaries of the Tennessee River. The *Unio lewisi*, and *U. crapulus*, of Lea, with which *U. cor* has hitherto been identified, come from a different drainage system.

The true *Unio cor* is characterized by Mr. Conrad, as having rays,—the young, beautifully rayed, and having a sulcus from the beak to base. Neither of which are ever exhibited by *lewisi*, nor are indicated upon the psendo-figure of *cor*. Mr. Conrad says the young shells resemble the *undatus*, Barnes, (Mr. Conrad's conception of *undatus*, was the *obliquus* of *Lamark*).

The true *U. cor* is to be found in many collections, under other names, among which the writer has noted *U. edgarianus*, *tuscumbiensis*, *andersonensis*, and others. The figure of *andersonensis* Lea represents an old, much inflated specimen, rather short behind, but otherwise quite characteristic.

[1] Dr. Pilsbry believes that Conrad's figure, pl. 3, fig. 3, represents the shell he described as *Unio cor*, and that it was a slightly older specimen than that now figured, but of the same species.

Mr. Conrad also observes that mature specimens of *U. cor* are sometimes *produced and cuneiform behind*, "like some varieties of *triangularis* of Raf.," (a species, in Mr. Conrad's estimation at that time, embracing the *group of pyramidatus etc.*

A NEW CALIFORNIAN LAND SNAIL.

BY HENRY A. PILSBRY.

EPIPHRAGMOPHORA ZECHÆ n. sp. Pl. III, lower figs.

The shell is strongly depressed, umbilicate (width of umbilicus contained nearly eight times in greatest diameter of the shell), rather thin. The whorls of the spire and as far as the front of the last whorl are dilute cinnamon, then changing to ecru-olive or dark olive-buff; there is a chestnut-brown band at the shoulder (about 2 mm. wide), bordered with inconspicuous, hardly noticeable bands paler than the ground-color. Surface is glossy, distinctly, irregularly striate, and immediately behind the lip it is closely and minutely granulose. The spire is a little convex, whorls $5\frac{3}{4}$, moderately convex, slowly increasing to the last, which is about double the width of the preceding, and decends a little in front. The aperture is broadly lunate, decidedly wider than high. Lip thin, the upper margin scarcely expanded, outer very slightly, basal very narrowly reflexed, the columeller margin broadly dilated.

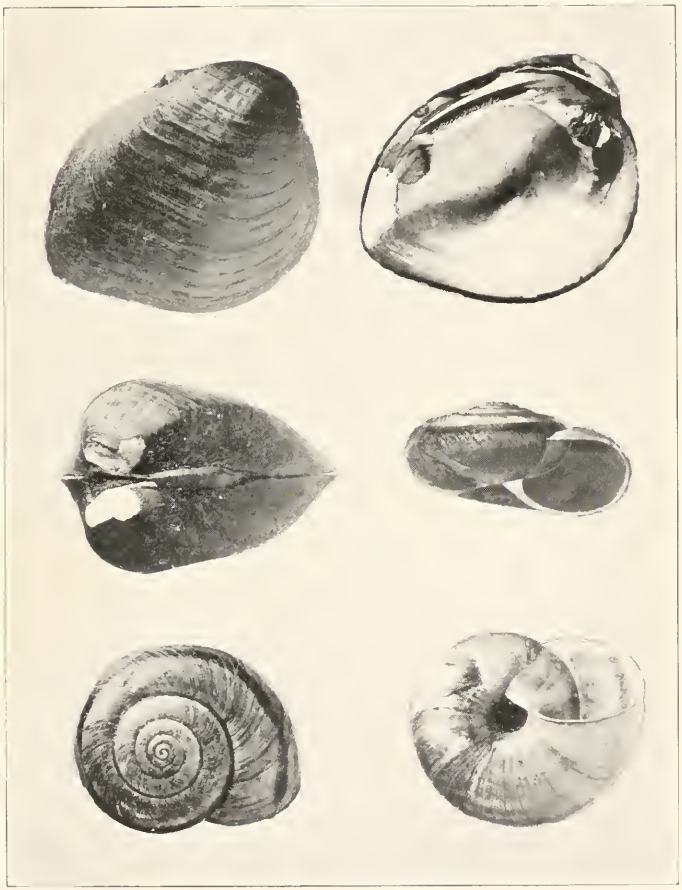
Alt. 15.2, diam. 31 mm.; aperture, alt. 14.3, width 17.8 mm.

Habitat, San Antonio Canyon, in the San Gabriel Mts., western edge of San Bernardino Co., California, at about 5000 ft. elevation (Miss Lilian Zech).

This fine species will probably prove to belong to the *Helminthoglypta* group, in which it most resembles *H. sequoicola* (Cooper); yet the absence of malleation on the last whorl and of granules on the spire are features more like *Sonorella*.

Miss Zech gives the following account of the locality.

The specimen was found in a narrow, winding canyon branching from the main San Antonio canyon at 4700 feet and at this point, some two or three hundred feet higher as near as I can



FRIERSON: UNIO COR CONRAD.
PILSBRY: EPIPHRAGMOPHORA ZECHÆ.

guess,—only wide enough for the creek bed, then full of rushing water, and the trail. It is a cool, moist, deep canyon,—with columbine, lilies, and ferns—and on the slopes much bay laurel. The trees were incense cedar and big-cone spruce. The snail lay on a pile of rock artificially heaped up at the creek's mouth, and contained the dead animal when found."

DESCRIPTION OF A NEW BIFIDARIA.

BY DR. V. STERKI.

BIFIDARIA MINUTA, n. sp.

Shell minute, ovate-conical with the apex nearly pointed, narrowly umbilicate and short-rimate, colorless whitish ; whorls four to four and a half, well rounded with deep suture, the last large, rounded at the base ; surface with very slight irregular striæ, apex without striæ, microscopically rugulose ; aperture rather large, well rounded, peristome sharp, not everted, with the ends somewhat approximate, palate with a very slight crest close to and parallel with the margin, inside with a very slight callus or none ; lamellæ and folds : parietal rather large, nearly simple, columellar medium, an inferior columellar near the base, or wanting ; the two principal palatals. Soft parts not examined. Alt. 1.2, diam. 1 mm. (other exs. 1.0 : 0.9).

Hab.: Woods, north of Geneva, Ashtabula Co., Ohio. Type : No. 1990, collection of North Am. Pupidæ.

This *Bifidaria* is near *tappaniana* Adams, but differs from that species as follows : it is much smaller, more conical, the whorls are less in number, more rapidly increasing, more convex, the last is comparatively larger ; there is no callus in the palate or a very slight one, the palatal folds are longer and there are no secondary ones (as supra- and interpalatal).

It was a surprise to find a new *Bifidaria* in this part of the country, and it appears that the (three) specimens on hand represent a distinct species. If not closely examined, they have the appearance of young or half grown of some other species, and probably were overlooked, partly due to the habit of most Bifidarias of this group of covering their shells with dirt.

PUBLICATIONS RECEIVED.

Report on the Turton Collection of South African Marine Mollusks, with additional notes on other South African shells contained in the United States Museum. By Paul Bartsch. U. S. Nat. Mus. Bull. 91 Pp. xii + 305, 54 plates. The basis of this report was a collection made by Lieut. Col. W. H. Turton, late Royal Engineers, at Port Alfred. This collection, made on the beach within 10 miles of the village, without dredging, contained 721 species. Other South African materials, notably the shells collected by William Stimpson on the North Pacific Exploring Expedition, in 1853, have also been studied. Although Mr. E. A. Smith, Mr. Geo. B. Sowerby and others have described many species from this fauna in the past few years, Dr. Bartsch found over 200 new species to define. All are well figured. New descriptions and figures are given of many briefly described species of Gould, from the type-specimens.

A list is given of nearly 1500 species reported from South Africa, not contained in the National Museum, with the suggestion that the specimens should be compared with material from the type localities of the several species, as he has found, in many instances, that South African shells which have been identified with species of other regions, are not specifically the same, though superficially similar.

A full bibliography is given, references to literature being omitted in the text.

The large number of new forms described and figured, with the full census of previous records, give this work a high value for those concerned with the South African marine fauna. It must become their book for constant reference, as Krauss's classic, "Die Südafrikanischen Mollusken" was for a former generation of mollusk students.

H. A. P.

Molluscan World. Compiled by C. R. Orcutt. 208+62 pp., 8vo, San Diego, 1915. This is a collection of records, descriptions and notes from a multitude of sources. With the exception of a list of shells found by the author around Hartland, Vermont (pp. 1–6), it is confined to species of California, Baja

California and the Rocky Mountain States, and may be regarded as a supplement to Carpenter's collection of papers on West American Mollusks. It is not arranged systematically but an index enables one to find any species.

H. A. P.

NOTES

A Stain for Radulae.—In many of the small mollusks it is difficult to make out the exact shape of the teeth on the radula because of their transparency. Moreover, a radula mounted in balsam becomes almost invisible in a short time. I have found that the radula may be readily stained without injuring the teeth of even the most delicate forms and without loosening them from the lingual ribbon.

For the marine forms, place the radula in a saturate aqueous solution of potassium bichromate for from five to fifteen minutes. However, the radula may remain in the stain without injury for an indefinite period. One radula left in this solution for three months was not harmed in the least. After staining, wash well in water and mount in balsam.

Land and freshwater forms cannot be handled in this way. For these a five per cent. solution of chromic acid works admirably. Place the radula on a slide, cover with four or five drops of the acid, and heat until the acid precipitates at the edge of the drop. If heated too long, the teeth may become detached from the lingual ribbon. Wash in water and mount in balsam.

These stains seem permanent in balsam, specimens so prepared having kept for eight months without fading, while specimens in glycerine jelly fade in a month or two. Though I presume other stains for radulae are known, these appear to be practical both in the simplicity of the process and the permanency of the stain.—Shields Warren.

A New Variety of Cypræa.—*Cypræa undata buttoni*, *n. v.* White, ornamented with three zigzag zones of chestnut, showing fine hair lines of chestnut between the zones ; sides and base white ; anterior extremity edged dark chestnut. Length, .50 to .75 inch.

Fiji Islands. It is named in honor of Mr. F. L. Button of Oakland, who has made a study of *Cypræa* and *Trivia*. The type is in the Stanford Collection.—Ida S. Oldroyd.

The Dates of Publication of the American Marine Conchology, by Timothy A. Conrad.—In the library of the Boston Society of Natural History are parts 1 to 3 of this work in their original dull yellow (probably somewhat faded) covers. Part one or No. 1, was published April, 1831. With this part was issued the title-page, with precisely the same wording and type except that on the cover the date, April, 1831, and No. 1, appear in the upper left and right hand corners, while on the title page the date (1831) only is at the bottom of the page. No. 1 contains pages 1 to 12 and plates 1 and 2. No. 2 was published September, 1831 (date at the bottom of the cover page) ; it contains pages 13 to 28 and plates 3 to 5. No 3 was published in May, 1832 (also dated at the bottom of the cover page) ; it contains pages 29 to 40 and plates 6 to 8. The entire work contains 72 pages and 17 colored plates. It would be of interest to know just when pages 41 to 72 appeared : if in two parts with the same interval between, the last part would have appeared in 1833. The above makes the date of publication for *Cardita borealis* 1832, while *Lyonsia hyalina* and *Lepton fabagella* would probably have the same date.—C. W. Johnson.

The Conchological Museum.—Mr. Y. Hirase has recently published another interesting album of his Conchological Museum. The 30 excellent illustrations show clearly the enormous amount of work he has accomplished and its great diversity in order to make the exhibit both popular and instructive. Nowhere in the world are the economic and artistic applications of the Mollusca so fully exhibited.

With the Album is sent an "Application for aid." For those in sympathy with his work and who wish to support his Museum, "The Supporting Club of the Hirase Conchological Museum has been formed, the dues per year are : Supporting member $2.50. Special supporting member $5.00. Life membership $30.00."

The Nautilus.

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COLLECTING AT NANTUCKET AND MARTHA'S VINEYARD.

BY REV. HENRY W. WINKLEY.

Helix hortensis has been recorded from both of these islands. My visit gave these results—At the town of Nantucket the species occurs sparingly in gardens, and abundant in the older cemeteries. It has a fondness for marble grave stones, especially in shady places. No banded forms occur in the town, but both white and yellow colors occur. In one cemetery I found white in one colony, and yellow a few rods away. The specimens from this island are all small, about $\frac{2}{3}$ the diameter of those from the coast of Maine.

Knowing there was a colony at Siasconset, seven miles away, at the eastern shore of the island, we drove over to examine a farm where I was told they occurred. I searched the place with negative results. Knowing their propensity for grave stones I asked the farmer's daughter if there was a cemetery at "Sconset". She didn't know the meaning of the word so I said burying ground. Oh yes! she said, half a mile down that road is where we pick blackberries. So I depended on my instinct and eventually located plain and five-banded forms near the shore. At Marthas Vineyard we lodged at Edgartown, but *H. hortensis* was not there, so we took an auto trip and examined cemeteries, woods, bushes etc., at Oak Bluffs, Vineyard Haven, Tisbury, Chilmark and Gay Head. I found no trace of it, but did get *Succinea ovalis* in one spot. I have in my cabinet a few specimens from Indian shell-heaps at Edgartown gathered some

years ago by Rev. Geo. D. Reed; but that spot is now covered with cottages. Diligent inquiry of the natives failed to reveal the hiding place of *H. hortensis*. Though two men assured me they had seen it, when they gave their descriptions I concluded one had found hermit crabs and the other fiddler crabs. Some people lacks "eddication."

Dredging and dip-net work revealed a few interesting facts. In Nantucket harbor *Odostomia seminuda* is large and abundant, while other Odostomias are scarce. The opposite is the rule at Woods Hole. *Crepidula fornicata* is exceedingly abundant. Every haul of the dredge brings up many clusters of from ten to twenty specimens clinging to each other.

Katama Bay, near Edgartown, is an interesting dredging ground. Results there were similar to Nantucket. The species found at Nantucket are :

Crepidula fornicata,
Crepidula plana,
Busycon canaliculatus,
Busycon carica,
Venus mercenaria,
Arca transversa,
Anomia simplex,
Odostomia seminuda,
Odostomia bartschi,
Odostomia bisuturalis,
P. (Syrnola) producta,
Nucula proxima,
Montacuta planulata,
Chaetopleura apiculata,
Nassa trivittata,
Astyris lunata,
Anachis avara,
Bittium nigrum,
Melampus lincatus,
Tornatina canaliculata,
Bela plicata,
Cingula minuta,
Cerithiopsis terebralis,
Lacuna vincta,
Turbonilla winkleyi,
Turbonilla nivea,
Turbonilla vinae,
Turbonilla elegantula.

At Katama Bay, Martha's Vineyard :

Crepidula fornicata,
Callocardia morrhuana,
Venus mercenaria,
Anomia simplex,
Laevicardium mortoni,
Tagelus gibbus,
Odostomia seminuda,
P. (Syrnola) producta,
Nucula proxima,
Nucula lateralis,
Tellina tenera,
Chaetopleura apiculata,
Nassa trivittata,
Astyris lunata,
Bittium nigrum,
Tornatina canaliculata,
Bela plicata,
Cerithiopsis terebralis,
Eupleura caudata,
Busycon carica,
Haminea solitaria,
Turbonilla winkleyi,
Turbonilla elegantula.

NEW SPECIES OF AMNICOLA FROM NEW MEXICO AND UTAH.

BY HENRY A. PILSBRY.

AMNICOLA NEOMEXICANA n. sp.

The shell is very small, minutely perforate, globose, corneous, rather solid. Surface smooth, not glossy. Whorls 3, moderately convex, the suture not deeply impressed. Aperture ovate, strongly oblique, angular above. Peristome continuous, the outer margin regularly arched, inner margin straight, slightly thickened. Length 1.6, diam. 1.3 mm.; longest axis of aperture about 1 mm.

Socorro, New Mexico, in warm springs. Types no. 121,113 in the Wheatley collection, deposited in Mus. A. N. S. P.

This species, known by many specimens, is smaller than *Amnicola micrococcus*, with a narrow aperture, straight inner lip and less impressed suture. Nearly all of the shells are eroded, the spire being deeply corroded in fully adult individuals. This gives an abrupt outline of the suture, in front view.

AMNICOLA DESERTA n. sp.

The shell is very small, perforate, broadly ovate, corneous, translucent, thin; surface glossy, very minutely marked with delicate growth-lines. The outlines of the spire are convex, the apex somewhat pointed. Whorls $3\frac{1}{2}$, strongly convex, the last more rapidly descending close to the aperture. The aperture is ovate, somewhat oblique, angular above. Peristome continuous and free from the preceding whorl. Length 2.4, diam. 1.7 mm.; longest axis of aperture 1.25 mm. Length 2.2, diam. 1.6 mm.

Washington Co., Utah. Types no. 121,112, Wheatley collection, in coll. A. N. S. P.

This little shell resembles the larger *Bythinella palomasensis*, from Lake Palomas in northern Chihuahua (NAUTILUS IX, 68, Oct., 1895; Dall, Proc. U. S. Nat. Mus. XIX, 1897, p. 369, pl. 31, fig. 9). The present species is broader, and evidently old individuals are smaller. The generic position is uncertain. As between a short *Paludestrina* and a long *Amnicola* there is little choice.

Washington county is in the southwestern angle of Utah, drained by the Virgin river, flowing into the Colorado. The specimens are "dead" shells, but not fossil, I think. According to the label, *Oreohelix strigosa* was found in the same place. The collector was not given for this or the preceding.

All of the adult specimens of *A. deserta* have the last whorl shortly free at the aperture. It is a senile form, probably extinct or on the verge of extinction. *Amnicolidæ* lead a precarious existence in the arid states. The rivers do not afford suitable stations. They have apparently never gained access to the small perennial streams of the higher mountains; and permanent springs and streams are so rare on the lower levels that the colonies are small, few and widely separated. The large proportion of extremely diminutive species in the arid region is remarkable. It may, perhaps, be looked upon as a permanent dwarfing due to unfavorable conditions.

Figures of both species have been prepared, to be published on a future plate.

TWO NEW BIVALVE SHELLS FROM URUGUAY.

BY WM. H. DALL.

In a small collection of shells from Uruguay recently received, among the marine bivalves were the following species which appear to be undescribed.

GLYCYMERIS DIAPHORUS n. sp.

Shell subcircular when young, in the adult higher than wide; the outer surface nearly smooth, with faint indications of obsolete radial ribs; the color whitish with reddish brown spots or small maculations; beaks small, not prominent, prosocoelus; the subumbonal area inequilaterally triangular, the anterior portion very short in proportion to the posterior, about 1 to 3, crossed by seven or eight diverging grooves and ridges; height of the area about one-fifth its length in the adult; hinge with ten or twelve teeth on each side, separated by a striated space; in the adult a large part of the posterior series may be obsolete or absent; anterior dorsal slope long and nearly straight, the

posterior short and rounded; interior smooth, the muscular scars prominent, the anterior more rounded than the other; basal margin with ten or twelve crenulations in the adult, more in the young; lateral margins smooth. Height of adult 38; breadth 35; diameter 18 mm.

Shell heap near Montevideo, Uruguay. U. S. N. Museum, No. 215083. Coll. Felippone No. 556.

Though the valves received are not fresh, they show the color markings. The most characteristic features of the species are the narrow umbonal angle (100°) and unusually inequilateral umbonal area, recalling the conditions in some species of *Limopsis*.

CALLOCARDIA (AGRIODESMA) FELIPPONEI n. sp.

Shell most closely resembling *C. morrhuana* Linsley (+ *C. convexa* Say) of the New England coast, and best described by a differential diagnosis from that well-known species. Surface of the present species similar in color, texture, and concentric sculpture; form more triangular, the umbones smaller, the anterior dorsal slope more depressed, the lunule somewhat longer; the posterior slope longer and less roundly arcuated into the less arcuated basal margin; the ligament markedly shorter, the hinge teeth larger and heavier; the pallial sinus similar in form and length but somewhat wider; the beaks appear more prominent, and the posterior cardinal tooth in both valves is relatively much larger and stronger.

Height of typical specimen 40 ; length 50 ; diameter 27 mm.

Maldonado, Uruguay ; U. S. N. Mus. No. 215082. Coll. Felippone, No. 582.

Young specimens of this species were collected by the U. S. Fish Commission Steamer Albatross in 59 fathoms, mud, off Rio de Janeiro ; the bottom temperature 57° F. These were referred to *C. aresta* Dall, of my Porto Rico report, not being old enough to display the differential characters. There is a thin, dirty grey, dehiscent periostracum on the present species.

The species is named in honor of Dr. Florentine Felippone of Montevideo, who has devoted much time to the study of the Natural History of Uruguay.

PLEUROBEMA LEWISII (LEA).

BY BRYANT WALKER.

As the result of some recent correspondence between Mr. L. S. Frierson and the writer, it has become evident that the synonymy, in which this species was included by Simpson in his Synopsis and Descriptive Catalogue, will have to be revised. We are both of the opinion that this species is entitled to specific recognition for the following reasons.

The synonymy given by Simpson is briefly this :

1834. *Unio mytilloides* var. Conrad. Type locality, Alabama River.

1834. *Unio cor* Conrad. From the Elk and Flint rivers, Ala.

1861. *Unio crapulus* Lea. Type locality, Etowah River, Ga.

1861. *Unio lewisii* Lea. Type locality, Coosa River, Ala.

Just what Conrad's *mytilloides* var. was, is not certain. If it was not a *Pleurobema*, it is entirely immaterial what it was so far as the species under consideration is concerned. But it was apparently a *Pleurobema* from the Alabama River. If so, it is equally immaterial what it was, so far as nomenclatorial purposes are concerned. In 1820 Rafinesque described a species from the Wabash as *Pleurobema mytilloides*. As in the case of so many of the species described by this author, there has always been an element of uncertainty as to what his species really was. By a general concensus of opinion among the earlier students of American *Unionidæ*, it was considered to be the same as the species subsequently described by Lea as *Unio pyramidatus*. Dr. Lea, himself, gave it doubtful recognition as a valid species and placed it near *pyramidatus* in his Synopsis. Simpson states that, in his opinion, the shells under this name in the Lea collection are an elongated form of *pyramidatus*. Conrad in his Synopsis of 1853 considered it a synonym of Lamarck's *clava*. It is quite probable that he was entirely correct in this disposition of this species, which would be a very satisfactory solution of the problem. It seems to be reasonably certain, however, that it was either *clava* Lam. or *pyramidatus* Lea. According to Dr. Ortmann, *pyramidatus* Lea is a *Pleurobema* and

not a *Quadrula*. But even this is immaterial, if Rafinesque's species can be satisfactorily identified as either of those species. If *mytilloides* Raf. is the same as *clava* Lam., it disappears in the synonymy. If it is the *pyramidatus* Lea, it would take precedence of that species. But in either event, and that is the important point here, the specific name *mytilloides* can not be used again for a different species of *Pleurobema*. So that, although Conrad's *mytilloides* was described as an *Unio*, his name, even if the species is clearly identified, can not be used if his type was a *Pleurobema*.

The shells, on which Conrad based his *Unio cor*, came from the Elk and Flint rivers, Ala. Both of these streams are tributaries of the Tennessee River. It is probable that the form described by Conrad as *cor* represents some species also described by Lea. Mr. Frierson has investigated that question (NAUTILUS, Jan., 1916, p. 102). But whatever *U. cor* is, it is quite clear that it is not the same as either of Lea's species, *crapulus* or *lewisii*. With the great increase in recent years of our knowledge of the faunas of the Alabama and Tennessee drainage systems, it has become more and more evident that there are very few species of *Pleurobema* that are common to both systems. The fauna of the Tennessee has been very thoroughly worked over and there can be no doubt that there is no species in that fauna that can by any approximation be referred to either of Lea's species.

The elimination of *cor* from further consideration leaves the two species from the Alabama system to be dealt with. Assuming, for the purposes of the argument, that they are synonymous, what name shall be used? Both were described in the same paper, but *crapulus* has page precedence. This, however, under the Code (see NAUT. xxviii, p. 125), is immaterial. I am of the opinion that precedence should be given to the name of *lewisii* for the following reasons:

1. The *lewisii* Lea is a well-defined and well-known species of the Coosa, and there can be no doubt as to what it is.

2. Lea's *crapulus* came from the Etowah River, Ga., and was described from a single specimen. It does not seem to have been found by any of the recent collectors. While it may be

an absolute synonym of *lewisii*, on the other hand, in view of the well-known variation of the species of this genus in the different rivers of the Alabama system, it is quite possible that it may be varietally or even specifically distinct. Its final position in the system must necessarily await its re-discovery in sufficient quantity to enable its standing to be definitely determined. If its accidental page priority were to be recognized, it would leave the specific type a matter of uncertainty for an indefinite period.

3. By adopting *lewisii* as the specific name, Dr. Lea's intention to perpetuate the memory of one of the leading conchologists of his time will be effective.

In view of these considerations and assuming the two forms to be synonymous, I select *Unio lewisii* Lea as the specific type.

The synonym, therefore, would be as follows:

PLEUROBEMA LEWISII (Lea).

1861. *Unio lewisii* Lea, Pr. Ac. Nat. Sci. Phila., p. 40.
1862. *Unio lewisii* Lea, Jl. Ac. Nat. Sci. Phila., v, p. 71, pl. vii, fig. 220; Obs., viii, p. 75, pl. viii, fig. 220.
1861. ? *Unio crapulus* Lea, Pr. Ac. Nat. Sci. Phila., p. 39.
1866. ? *Unio crapulus* Lea, Jl. Ac. Nat. Sci. vi, p. 42, pl. xv, fig. 40.
1867. ? *Unio crapulus* Lea, Obs., xi, p. 46, pl. xv, fig. 40.
1900. *Pleurobema cor* Simpson, Syn., p. 754 (not of Conrad).
1914. *Pleurobema cor* Simpson, Desc. Cat., p. 765 (not of Conrad).

NOTE.—The foregoing article was received before the publication of that on *U. cor* in the January number. Most of the matter relating to *cor* has therefore been eliminated.—EDS.

ANODONTA DANIELSI LEA IN COLORADO.

BY MAX M. ELLIS.

While collecting fishes during October in Black Wolf Creek, a tributary of the Arikaree River in eastern Colorado, a large, isolated colony of bivalves was discovered, specimens from

which have been identified by Mr. Bryant Walker as *Anodonta danielsi* Lea. This collection constitutes the first record of this species from Colorado. The only other species of *Anodonta* known to occur in Colorado is *Anodonta grandis*, listed from two localities, Lodgepole Creek in the extreme northeastern corner of the state and a reservoir about 30 miles north of Denver. (Henderson, Mollusca Colo. 1912).

The stream, Black Wolf Creek, is a small, rapid, spring-fed brook, about seven miles long and averaging two feet wide during low water. It joins the Arikaree River about eight miles from the Colorado-Nebraska line. As the Arikaree River frequently goes dry in Colorado during the summer months, Black Wolf Creek which carries water throughout the year from its small springs, is left an isolated unit during these dry seasons. The bottom of this stream is coarse sand or fine gravel except in the backwaters upstream from the two artificial dams which have been placed across the stream to deflect water for irrigation purposes. Back of each of these dams the stream widens to 20 feet or more for a distance of several hundred yards, in which portions of the stream the water averages four feet in depth. In this quiet water the fine blue clay carried by the stream has been deposited on the bottom in a compact layer about 20 inches thick.

The colony *Anodonta danielsi* was found in the deep water back of the upper dam on Black Wolf Creek, which is located about two and one-half miles north and a little west of the Indian battleground known as Beecher's Island. This dam is little more than a low mud wall and it has not increased materially the depth of the water in a naturally deeper portion of the stream. This fact together with the finding of large numbers of broken shells on and in the banks of the stream where they had been carried by mammals, and the absence of shells in the deep water back of the lower dam (a more elaborate wall which has changed the water-level back of it) suggests that the colony found has been established for a long time. The individuals were very abundant, often six or more large adults occurring in a space a foot square. Each shell was securely buried in the dense blue clay so that a rather strong pull was required to

loosen it, and the projecting siphonal portion was usually covered with soft silt.

The one hundred specimens collected at random from this colony were very uniform in size. A typical shell has the following measurements: length, 140 mm.; height from margin to hinge, 80 mm.; diameter, 55 mm.; thickness of the individual valve, 2 mm. A comparison of these measurements with those given by Simpson (Cat. p. 428, 1914) for this species shows the average Colorado specimen to be almost one-half longer than specimens from the type locality, Topeka, Kansas. Moreover, a few shells from Black Wolf Creek are 180 mm. long. Only a few juvenile specimens were found, the smallest of these measuring 70 mm. in length. These small specimens are of a brilliant green color and have a more or less definite pattern of rays. The adult shells were a rich, pitchy black when first taken from the water and as dried and cleaned specimens they have a polished or varnished appearance. The umbonal half of each valve is black or greenish black, and the marginal half a bistre brown, the color transition between the two portions of the shell being rather abrupt. The soft parts of the adults were also highly colored, among the individuals collected two forms not correlated with sex, were evident: a bright salmon-pink type and a dull chocolate-brown type.

While cleaning the shells it was noted that most of the females were distended with eggs. Many shells contained large irregular pearls, several of which were at least 15 mm. in length. These pearls were invariably irregular and more or less attached to the shell. Although their lustre was excellent, showing a good deposit of lime, they were very frail. Several were opened and found to contain masses of blue clay like that in which the mussels themselves were found. Ranchers living along Black Wolf Creek told of several freshets during the past three years which swept out numbers of shells from the deep water back of dam. It is possible that these mud pearls may have been caused by the sudden introduction of mud into the shells during these floods.

It may be added that there is a large specimen of *Anodonta* in the Museum of the University of Colorado marked *Anodonta*

grandis, which is one of a few collected about 30 miles north of Denver. This shell, which is 160 mm. long and 100 mm. high, and the specimens from Black Wolf Creek were compared, as *Anodonta danielsi* is a member of the *Anodonta grandis* group. The oral end of this *Anodonta grandis* is rather abruptly truncated, the same portion of the eastern Colorado shells being broadly rounded; the umbonal region is reddish brown shading to almost black along the margin of the valve, the shell as a whole lacking the greenish cast so evident in the specimens from Black Wolf Creek; and the *Anodonta grandis* shell is more inflated and broader than the others. The umbonal sculpture of this *Anodonta grandis* and of the *Anodonta danielsi* from Black Wolf Creek seemed identical, and the contour of the siphonal end of each valve is the same for both species.

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NOTES.

Appetite of Euglandina.—M. L. Vignal gives an interesting account of the behavior of *Glandina guttata* C. & F. from Mexico kept alive and under observation for some time (Bull. Soc. Nat. d'Acclimatation, Nov. 1915, pp. 344-349). Ordinarily a large *Glandina* ate an adult *Helix aspersa* every 2 or 3 days. Between June 6 and Aug. 28 (1911) it devoured 28 *Helix aspersa*, weighing, without the shell 121 grams (about 65½ ozs.) Five Glandinas ate 102 *Helix variabilis* and 7 *H. nemoralis* in 17 days, an average of over 6 per day for the five.

Note on Cæcilioides.—In 1907 the writer proposed a group *Cæcilianopsis* to include the very small *Cæcilioides* of tropical America, *C. iota* (C. B. Ad.), *C. consobrina* (Orb.) and their varieties (See Manual of Conchology XX, p. 38). Not expecting to find a land snail in a book dealing with marines, I overlooked the publication by De Folin of *Karolus primus*, a minute shell found at Vera Cruz (Les Fonds de la Mer I, p. 182, 189,

pl. 26, fig. 7, 8; 1870). This is evidently identical with *C. consobrina veracruzensis* (Crosse & Fischer), 1877. As the name is prior, the eastern Mexican race will be called *Cæcilioides consobrina prima* (De Folin); and the subgenus *Cæcilianopsis* will be replaced by *Karolus* De Folin. So far as I know, *Karolus* has not been noticed by any author since its publication. In Scudder's Nomenclator and the Zool. Record Index it is referred to as a genus of Hym [enoptera].—H. A. Pilsbry.

PUBLICATIONS RECEIVED.

Fauna of New England, 13, List of the Mollusca, by Charles W. Johnson (Occ. Pap. Boston Soc. Nat. Hist., Vol. VII). 231 pp., Dec., 1915. The 200-fathom line has been taken as defining the seaward limit of the New England area, as the 100-fathom contour would exclude part of the Gulf of Maine. 710 species and subspecies are listed, of which 450 are marine. Probably about 80 per cent. of these are deep-water species. There are 80 species and subspecies of land shells, 83 fresh water gastropods, and 6 *Auriculidæ*. The *Unionidæ* number 26, Sphaeriidæ 65. References are given to the original descriptions, and to New England records. Type-locality is given, and the New England distribution in detail. The nomenclature has been brought up to date, a valuable feature, which will be appreciated by many naturalists beyond the limits of New England, since the information could only be obtained elsewhere by consulting a great number of books and papers, abounding in conflicting use of names. The localities given include all published records, and many not before in print, from the collections of the author and his associates.

Mr. Johnson's List is a valuable addition to the catalogues of New England animals which the Boston Society is publishing. It should be in the library of every working conchologist. It may be obtained from the Society, price $1.00.—H. A. P.

The Nautilus.

Vol. XXIX. MARCH, 1916. No. 11

MOLLUSKS OF GENEVA, OHIO.

BY V. STERKI.

About a mile and a half north of Geneva, Ashtabula county, Ohio, in the northeast corner of the state, and about three miles from Lake Erie, there are some low woods, an ancient lake-bottom land. The soil is a sandy clay, and at some places mucky. During spring, the lower parts are more or less covered with water; in summer, the soil often becomes dry as a bone, for weeks and even months.

From 1909 to 1915, I had chances to do more or less collecting there every year, and at various seasons. The following list may be of some interest, for being approximately complete, and for some notes on ecology, etc. Some species found on the open land near those woods, and originally part of them, are added and marked with a *. The species are numbered for easy reference.

1. *Gastrodonta intertexta* Binney, common especially at low places where *Sphærium occidentale* and *Succinea ovalis* are living, and on which probably they are principally feeding.
2. *Zonitoides arboreus* Say, common.
3. *Z. minusculus* Binney, frequent.
4. *Z. exiguus* Stimpson, common at some places.
5. *Z. milium* Morse, scarce.
6. *Omphalina fuliginosa* Griffith, not common, and apparently quite scarce in the last years.

7. *O. inornata* Say, frequent.—Some years ago I found a specimen of *Polygyra thyroides* in the body whorl of which there were two *O. inornata*, on opposite sides, entered through holes made in the shell; inside of the apical whorls of the same was one *Gastrod. intertexta*; all had been feeding there, and of the victim's body only a few scant remnants were left.

8. *Hyalina* [*Vitrea*] *indentata* Say, not common.

9. *H. radiatula* Alder (*hammonis Ström.*), not rare.

10. *H. wheatleyi* Bland, not rare.

11. *H. ferrea* Morse, not rare.

12. *H. multidentata* Binney, rather common.

13. *Euconulus chersinus*, common.

14. *E. sterkii* Dall, scarce.

15. *Agriolimax campestris*, common.

16. **A. agrestis* Linné, in a brick yard near by.

17. *Circinaria concava* Say, common.

18. *Helicodiscus lineatus* Say, not rare.

19. *Patula* [*Pyramidula*] *alternata* Say, common.

20. *P. perspectiva* Say, rather common.

21. **P. cronkhitei anthonyi* Pilsbry, not in the woods, but outside.

22. *Punctum pygmæum* Draparnaud, common.

23. *Sphyradium edentulum* Drap., rare.

24. *Polygyra albolabris* Say, rather scarce.

25. *P. zalcta* Binney, very rare; only one living specimen and a dead shell were found, of a form much larger than the one generally known.

26. *P. thyroides* Say, common, large, with thin shell and lip, and of brownish color, rather different from those found on limestone soil. Repeatedly they were found gathered on and around old ash heaps from brush fires.

27. *P. palliata* Say, not common.

28. *P. tridentata* Say, common.

29. *P. monodon fraterna* Say, scarce.

30. *P. hirsuta* Say, rather common.

31. *Philomycus carolinensis* Bosc., rather common.

32. *Ph. ohiocnsis* St., MS., a single specimen.

Note: In 1900, I found two specimens of this near Chippewa

Lake, Medina Co., O., and then looked for others in vain, for over a dozen years. It is evidently none of the described species; the jaw and radula are different from those of both *carolinensis* and *dorsalis*, but the jaw is more like that of the former, without strong ribs. The other parts of the anatomy have not been examined, and so it remained unpublished. The body, when extended, is about 28 mm. long, slender; the dorsum is tan-colored, without any markings.

33. *Ph. dorsalis* Binney, not scarce.

34. *Strobilops labyrinthicus* Say, rare.

35.* *Vallonia pulchella* Müller, not in the woods, common around a barn near by.

36.* *V. excentrica* Sterki, with the preceding.

37. *Bifidaria contracta* Say, common.

38. *B. pentodon* Say, common; variable with respect to the apertural lamellæ and folds.

39. *B. minuta* Sterki; for description see page 105.

40. *B. corticaria* Say, scarce.

41. *Vertigo gouldii* Binney, not rare.

42. *V. ovata* Say, scarce.

43. *V. elatior* Sterkii, scarce. Appears to be distinct from *ventricosa*, to judge by material from a number of States.

44. *V. tridentata* Wolf, rare.

45. *V. milium* Gould, rather scarce.

46. *Cionella lubrica* Müller, rather scarce.

47. *Succinea ovalis* Say, common.

48. *S. retusa* Lea, scarce.

49. *S. avara* Say, scarce.

50. *Carychium exiguum* Say, scarce.

51. *C. exile* H. C. Lea, common.

52. *Lymnæa parva* Lea, scarce.

a. * *L. parva sterkii* F. C. Baker (probably, according to F. C. Baker); ditch, outside.

53. *L.*——? (small, slender, probably immature), two specimens in siftings, with land snails.

54. *Planorbis trivolvis* Say, in a permanent pool, or small pond.

55. *P. exacutus* Say, pools (with 61), not rare.

56. *Segmentina armigera* Say, rather scarce, but found living, under dead leaves, even after prolonged drought.

57. *Physa gyrina* Say, rather scarce, a small form, under the same conditions as 56 and 60; a larger form is common in a drainage ditch, outside, which is usually dry in summer except after heavy rains.

58. *Aplexa hypnorum* Linné, with 61, scarce, small; one specimen was found with 53.

59. *Amnicola cincinnatiensis* Lea, one dead shell was found in a small ditch (with 52 a), far away from a creek.

60. *Sphærium occidentale amphibium* St., common at lower places in the woods; even after the ground has been dry for weeks, these mussels are found living, at all stages of growth; not found with 61!

61. *Musculium truncatum* Linsley, frequent in pools where water lasts longer, but which are usually dry during summer.

62. * *Pisidium abditum* Haldeman, not rare in the ditch mentioned under 57.

It appears to be worth noting that some species have not been found, which should be expected at such a place rather than many of those listed, e. g. *Zonitoides nitidus*, *Enconulus fulvus*, *Polygyra multilineata*, *Bifidaria tappaniana*.

NOTES ON MOLLUSCA OF CENTRAL MONTANA.

BY S. STILLMAN BERRY,

Redlands, California.

Some two years ago I published in the NAUTILUS (vol. 26, pp. 130–131) a short list of mollusks taken at Winnecook, Meagher County, Montana. Having had occasion to visit the same locality, and hence the opportunity to make further collections, every summer since, it now seems worth while not only to record the additional species which have been found, but to revise the first list in its entirety. A fairly good idea

may be gained of the way the various species run by the numbers of specimens taken, recorded in parentheses after each species. In 1914 I kept a fairly accurate census of the living specimens collected (first number in parenthesis), and in 1915 did the same for the drift specimens, and these figures indicate fairly well the relative abundance of the different forms. All this drift material (listed in the second number in parenthesis) was taken from three quarts, gross measure, or one and a half pounds of fine flotsam, scooped up from one little pocket on the bank of the Musselshell River.

Mollusca of Winnecook, Montana.

Vallonia costata montana Sterki (88 ; 390).
Pyramidula cronkhitei (Newc.) (68 ; 98).
Vitrea hammonis (Ström.) (5 ; 22).
Zonitoides arborea (Say) (70 ; 15).
Zonitoides minuscula (Binn.) (0 ; 41).
Euconulus fulvus (Müll.) (12 ; 4).
Agriolimax campestris (Binn.) (7 ; 0).
Pupilla blandi (Morse) (0 ; 4).
Vertigo binneyana Sterki (7 ; 81).
Vertigo ovata (Say) (0 ; 1).
Cochlicopa lubrica (Müll.) (8 ; 14).
Succinea avara Say (1 ; 9).
Succinea oregonensis Lea (1 ; 0).
Succinea retusa Lea (21 ; 0).
Lymnaea caperata Say (unrecorded ; 12).
Lymnaea palustris Müll. (unrecorded ; 1).
Lymnaea parva Lea (0 ; 19).
Planorbis antrosus Conrad (taken in 1914).
Planorbis parvus Say (0 ; 11).
Planorbis umbilicatellus Ckll. (0 ; 10).
Physa gyrina Say (taken 1914).
Aplexa hypnorum (Linn.) (taken 1914).

The list brings out a somewhat curious mingling of eastern and western forms at a point which is well to the eastward of the Continental Divide. The intimate association of apparently

typical *Succinea oregonensis* (a characteristic western species) with equally representative *S. avara* in the self-same *swale* is very interesting.

The *Euconulus* are *E. fulvus* all right, but a few of the specimens furnish at least an approach to the *alaskensis* of Pilsbry.

Vallonia costata montana has been by all odds the most abundant species taken. Mr. Vanatta kindly compared some of the Winnecook shells with Sterki's types of this form in the collection of the Philadelphia Academy, so that the identification seems a comfortably certain one. He writes that "the smallest-sized Vallonia are just about the size of the types," so that it would appear that Sterki's specimens were not characteristic in size or represented a somewhat smaller race.

The single *Planorbis*, previously reported with considerable doubt as *P. callioglyptus* Vanatta, was also sent to Mr. Vanatta. He was unable to confirm the identification, so that the species is here rejected from the list. The specimen is probably too young for safe determination.

Despite diligent search I have as yet discovered not a single mussel shell in the Musselshell River. I one day picked up a single worn and minute fragment on the shore, and that is all.

Mollusca of Oxford, Montana:

In a small stream called Elk Creek at a point about one mile south of Oxford Station, Meagher County, the following species were taken in the month of June, 1914 and 1915.

Pisidium compressum Prime.
Pisidium compressum laevigatum Sterki.
Planorbis parvus Say.
Physa gyrina Say (very large).
Lymnaea caperata Say.
Lymnaea obrussa Say.
Lymnaea palustris Müller.
Lymnaea parva Lea.
Vallonia costata montana Sterki (dead).

Swimming Woman Creek Canyon.

On July 4, 1914, a very brief visit to Swimming Woman Creek Canyon in the Big Snowy Mountains resulted in the following collection:

	East wall	Canyon floor
Vallonia costata montana Sterki . . .	30	5
Thysanophora ingersolli convexior Ancey (dead)	14	—
Oreohelix cooperi berryi Pilsbry. . . .	55	—
Pyramidula cronkhitei (Newcomb) . . .	2	2
Zonitoides arborea (Say) (very large) . .	6	1
Euconulus fulvus (Müller)	7	3
Vitrina alaskana Dall (dead)	2	2
Pupilla muscorum (Linn.) (dead) . . .	1	—
Vertigo modesta parietalis Ancey (dead) . .	4	—

The *Euconulus* seem to me for the most part intermediate between typical *fulvus* and *alaskensis*. They could perhaps be classified with equal exactitude either way.

The *Oreohelices* listed are members of a very small race described in a recent number of this periodical by Pilsbry (NAUTILUS vol. 29, p. 48), but it is so much the most conspicuous snail of the region that such figures of population as those given in the above columns indicate the relative abundance of all the smaller forms in a very unsatisfactory way. I doubt very much whether *Oreohelix* actually does replace *Vallonia* as the most abundant snail, even at this altitude. Live shells of both were fairly common, and dead ones abundant all over the eastern wall of the canyon at the spot visited, occurring at or near the surface among the mass of small loose rock and shrubbery which covered the slope. The other species, where so noted, were in the same situation, while those taken on the floor of the canyon were found under sticks and small logs in rather moist situations along the creek.

The locality for both slope and floor is just within the mouth of the canyon, and is probably just south of the present county line. If so, this would bring it into Musselshell County and not Fergus, as stated in the original description of *O. c. berryi*.

I am unable to find that any previous collecting has been done either in the Big Snowies or the neighboring ranges, but Mr. Robert Wellington brought me a few specimens of a larger and more typical race of *Oreohelix cooperi* from near the head of Neil Canyon, on the same side of the range as the present locality, but some miles to the westward.

It might be added that I have taken *Planorbis antrosus*, *Physa gyrina*, and *Lymnaea caperata* in some abundance in the pools and ditches along the river bottom at Harlowton, Montana.

I am indebted to Mr. Frank C. Baker for determinations of the *Lymnaeidae* mentioned in this article : to Mr. E. G. Vanatta for various help in verifying and comparing specimens ; and likewise to Dr. H. A. Pilsbry and Mr. George H. Clapp.

REVERSED OR SINISTRAL SHELLS.

BY F. A. SAMPSON.

In NAUTILUS, vol. ix., 1895, p. 94, Prof. Wetherby told of three reversed shells which had belonged to him. A *P. thyroides* and a *P. multilineata* he had given to John G. Anthony for the Cambridge collection, and at that time he had another *thyroides* in his collection. He did not give the locality of the shells, but as he had formerly lived at Cincinnati, it is probable that the shells were from that neighborhood. He knew of a third *thyroides* collected near Cincinnati by Mr. Stannage, and of a *mitchelliana* collected by Prof. F. W. Bryant near the same place. Dr. Lewis had an *albolabris* in his collection.

In NAUTILUS, vol. x, January, 1897, p. 104, C. F. Ancey gave a list of 21 sinistral specimens of shells that were normally dextral. Only two of them were American—*Polygyra thyroides* from Connecticut, and *Campeloma decisum* from New York.

In the February number of the same volume Pilsbry reported that he had a collection of *Campeloma decisum* made by W. W. Jefferis, of Philadelphia, collected at Fort Edward on the Hudson River, New York, examined for sinistral shells, and among

681 specimens from one-fourth to full size there was no sinistral shell, but of 410 uterine young three were sinistral.

A note from Jennie E. Letson in NAUTILUS, vol. xi, July, 1897, page 33, stated that the collection of about a hundred species of *Ampullaria* in the Philadelphia Academy of Natural Sciences had only one sinstral shell, and that was *A. conica* Wood, but she did not state the locality of it.

In NAUTILUS, vol. v, page 83, Leslie M. Cockerell of Norwood, San Miguel County, Colorado, reported a sinistral *Patula cooperi*. Pilsbry added a note that while this was a rare malformation in America, it occurred more frequently with this than in most species, and that several cases were on record.

F. C. Baker in "The Lymnæidæ of North and Middle America," says that a sinistral Lymnæa is rarely found. A *Galba obrussa* was found in the collection of Henry Hemphill, and a *Galba palustris* in the collection of Dr. W. A. Nason.

I have in my collection two sinistral shells of *Campeloma subsolidum*, from Flat creek, in Pettis County, Missouri, and a *Pyramidula alternata* Say, from near Columbia, Mo. This is the first sinistral land shell I have ever found.

In the neighborhood of this town I have found more abnormal crinoids, than in all other localities combined ; but whatever the causes may have been to produce these malformations, they have not noticeably operated to produce abnormal shells.

Columbia, Mo.

MOLLUSKS OF ANAHEIM BAY, CALIFORNIA.

BY E. P. CHACE.

I am enclosing a list of shells that were collected at Anaheim Landing by myself and wife with a little help at times, the shells being all in my collection. I have done no dredging and think that if I did I would add several species to the list. The total length of shore included in the collecting is less than 3½ miles, about ½ being in the bay and the rest ocean beach, and no rocks in sight within 4 to 5 miles.

Collected at Anaheim Bay.

Acanthina spirata, Blainville
Alectrion fossata, Gld.
Alectrion mendica cooperi, Fbs.,
Alectrion perpinguis, Gld.
Arcularia tegula, Rve.
Bullaria gouldiana, Pils.
Calliostoma gemmulatum, Cpr.
Calliostoma tricolor, Gabb.
Cerithidea californica, Hald.
Cerithiopsis carpenteri, Bartsch.
Cerithiopsis pedroana, Bartsch.
Columbella gausapata, Gld.
Columbella gausapata carinata, Hds.
Conus californicus Hds.
Crepidula onyx rugosa, Nutt.
Crucibulum spinosum, Sby.
Haminea vesicula, Gld.
Littorina scutulata, Gld.
Lucapina crenulata, Sby.
Lucapinella calliomarginata, Cpr.
Melampus olivaceus, Cpr.
Olivella biplicata, Sby.
Olivella pedroana, Cpr.
Phasianella compta, Gld.
Polynices lewisii, Gld.
Polynices recluziana, Desh.

In the vicinity of the Bay:

Cardium quadragenarum, Conr.
Cardium substriatum, Conr.
Chione fluctifraga, Sby.
Chione succincta, Val.
Chione undatella, Sby.
Cooperella subdiaphana, Cpr.
Diplodonta orbella, Gld.
Donax californica, Conr.
Heterodonax bimaculatus, D'Orb.
Macoma indentata, Cpr.
Macoma nasuta, Conr.
Mactra californica, Conr.
Modiolus capax, Conr.
Ostraea lurida rufoides, Cpr.
Paphia staminea, Conr.
Paphia staminea laciniata, Cpr.
Pecten circularis aequisulcatus, Cpr.
Petricola denticulata, Sby.
Pholas pacifica, Stearns.
Platyodon cancellatus, Conr.
Psammobia californica.
Sanguinolaria nuttallii, Conr.
Saxidomas nuttallii, Conr.
Schizothaerus nuttallii, Conr.
Tagelus californianus, Conr.
Tagelus californianus subteres, Conr.
Tellina carpenteri, Dall.
Zirfaea gabbi, Tryon.

Collected alive, on the sandbars and beach near the entrance of the Bay.

Bursa californica.
Donax levigata, Desh.
Murex festivus, Hds.
Tivela crassatelloides, Conr.
Turris ophioderma, Dall.

Washed up on the beach after storms, alive or very fresh.

Amiantis callosa, Conr.
Chama exogyra, Conr.
Chama pellucida, Sby.
Cryptomya californica, Conr.
Glottidea albida, Hds.
Macoma secta, Conr.
Mactra hemphilli, Dall.
Mactra planulata.
Metis alta, Conr.
Modiolus flabellatus, Gld.
Modiolus rectus, Conr.
Paphia tenerrima, Cpr.
Periploma discus, Stearns.
Periploma planiuscula, Sby.
Siliqua lucida, Conr.
Solen rosaceus, Cpr.

Dead shells collected on the beach.

Bathytoma tryoniana.
Dentalium neohexagonum, S&P.
Epitonium hindsii, Cpr.
Sinum debilis, Gld.
Turritella cooperi, Cpr.
Epitonium bellastriatum, Cpr. (fragment).
Anomia peruviana (upper valves).
Labiosa undulata, Gld. (broken valves).
Mactra catilliformis, Conr.
Panopea generosa, Gld.
Pecten giganteus, Gray.
Thracia plicata.
Yoldia cooperi, Gabb. (valves only).

Collected on the piles of the bridge across the entrance of the Bay.

Acmaea patina, Esch.
Acmaea persona, Esch.
Littorina planaxis, Nutt.
Littorina scutulata, Gld.
Cypraea spadicea, Gray. (1 only)
Lasaea rubra, Mont.
Myrina diegensis, Dall.
Mytilus californianus, Conr.

Occasionally a rock washes in on the beach containing some Lithophagus plumula, Cpr. and Kellia laperousii, Desh. and the kelp brings in Acmaea incessa, Hds. Eulima (species undetermined) has been found in a kelp holdfast and a dead Polynices lewis with 7 Crepidula excavata, Brod. on it washed in after a storm.

Most of the shells listed above were collected by Mr. and Mrs. E. P. Chace within the last three years. The others were collected by Mrs. J. E. Herbst, Valentine Herbst and Otto Keim, and were collected during the same period of time.

NOTES.

OLIVA PERUVIANA VADI, new name.—This is the brown variety of *Oliva peruviana* Lamarck, described in THE NAUTILUS volume 24 (1911), p. 122 and also referred to in THE NAUTILUS volume 29 (1915), p. 67 as *Oliva peruviana castanea* 'Ford' Johnson, from Peru; but it is not *Oliva flammulata castanea* Dautzenberg from West Africa, described in the Actes de la Société Linneenne de Bordeaux volume 64 (1910), p. 79. The name *castanea* 'Ford' Johnson being preoccupied by *castanea* Dautzenberg, I propose the name *vadi* for the Peruvian shell. The types are tray number 111703, in the collection of the Academy of Natural Sciences from Peru. This variety is figured in Reeve's Conchologia Iconica volume 6 (1850), Monograph of the genus *Oliva* plate 9 figure 14*c*., and also in Tryon's Manual of Conchology volume 5, plate 18, figure 57.—E. G. Vanatta.

PUBLICATIONS RECEIVED.

The Mollusca of Georgian Bay. By A. D. Robertson, B. A., University of Toronto. Contrib. to Canadian Biology, Fasciculus II, Ottawa, 1815, pp. 95–111 ; 3 plates. An interesting study of the forms of a restricted area. 37 species are listed from Go Home Bay, with notes on their stations and characters, especially such as seem correlated with the conditions of life. "In general the species of Mollusca exhibit great flexibility in their environmental relations. In many cases ecological selection is operative within broad limits, while in a few the environmental type is more or less specific. The chief factors in this selection appear to be (a) exposed or protected situation, (b) depth of water, (c) degree of aeration, (d) character of the bottom, and (e) food conditions. In the genus Lymnaea, the long-spired forms occur in the stagnant bays, while the short-spired ones inhabit rocky shores." Most of the species are illustrated on three excellent plates.

COKERIA SOUTHALLI MARSHALL.

The Nautilus.

Vol. XXIX. APRIL, 1916. No. 12

A NEW GENUS AND SPECIES OF NAIAD FROM THE JAMES RIVER AT HURON, SOUTH DAKOTA.

BY WILLIAM B. MARSHALL.

Cokeria, new genus.

Characters those of the new species described below.

Cokeria southalli, new species. Plate IV.

Shell gaping anteriorly, moderately thin, subquadrangular tending to subtriangular; abruptly rounded anteriorly, posterior margin nearly straight and perpendicular, dorsal margin straight, ventral margin gently curving throughout its entire length. Valves widest just in front of the posterior ventral angle. Umbones at about the anterior third of the dorsal margin, high and incurved, the second growth line nearly horizontal. Posterior dorsal ridge very high, obtusely angular. Posterior area descending abruptly from the ridge and somewhat wing-like. Greatest inflation is along the umbonal ridge. A pronounced furrow extends from the umbo to the lower third of the posterior margin. Seven rest-periods distinctly marked by concentric dark lines. Anteriorly from the middle portion a bold rounded rib occurs just below each rest-period. Dorsal area faintly radiately striate. Color, varying shades of chestnut, lighter (nearly straw color) anteriorly, darker posteriorly, rest stages sharply defined by blackish lines. Umbonal region faintly

tinged with greenish. Periostracum thin, slightly glossy, closely adhering.

Nacre anteriorly lustrous white and thickened, posteriorly thin, violaceous and brilliantly iridescent. Pallial line not sharply defined and with several concentric striae above it, its anterior portion radiately striated. Anterior adductor and retractor scars separated, deep and rough, posterior scars superficial. Dorsal muscle scars concealed by the incurving of the upper portion of the valve.

Lateral tooth of right valve thin, very high, wing-like, striated longitudinally. Laterals of left valve similar to that of right valve, but smaller, the groove between them being very narrow. Pseudocardinals of right valve two, thin, opposite, the upper one being the stronger. Pseudocardinals of right valve coalescing, standing in the same straight line, the anterior one high, slightly curved, the posterior low, its summit irregularly crenulated. The sculpture of each umbo consists of four concentric ridges, highest (almost a nodule) at their posterior ends, and numerous concentric striæ.

The type U. S. National Museum, Cat. No. 215130 comes from the James River at Huron, South Dakota, and was collected by the U. S. Bureau of Fisheries. It measures : Length, 81 mm. ; Height 53 mm. ; Diameter 44 mm.

Robert E. Coker and John B. Southall, both of the U. S. Bureau of Fisheries, first called attention to this shell in their "Description of Shell found in the James River at Huron, S. Dak., July 27, 1913,"[1] in which the shell is described and figured, with the following statement :—"Characteristic features of the shell are its triangular or pyramidal form and its remarkable inflation, which are strongly suggestive of the inflated types of *L. luteola ;* its compressed sharp teeth which are of the *Lampsilis* type to an extreme ; the color of epidermis and characteristic color of nacre, which find correspondence only in species of *Quadrula,* especially in *Quadrula undulata.* The pyramidal shape of the shell is also suggestive of *Q. undulata.* It is not

[1] "Mussel resources in tributaries of the Upper Missouri River" in Rep. U. S. Commissioner of Fisheries for 1914 (1915).

possible at the present time to place the specimen in any described genus."

The resemblance to *L. luteolus* is remote and is confined to the character of the teeth. The resemblance to *Quadrula undulata* is more intimate. The undulations of the umbones are of the *Quadrula* type and of course entirely different from the double-looped, fine, wavy undulations of *luteolus*. The teeth are as different from those of *Quadrula* as the undulations of the umbones are different from *Lampsilis*, and consequently the shell cannot belong to either of those genera. There seems to be no possibility that the shell can be a smooth *Q. undulata* nor a hybrid of *L. luteolus* and *Q. undulata* and consequently it requires a new generic name.

LAND-SHELLS FROM ANAFE HILL IN THE HAVANA PROVINCE, CUBA.

JOHN B. HENDERSON.

The Havana province has been so much exploited by naturalists it could hardly be expected to offer any more novelties to a conchologist. On the contrary it appears to yield almost as much in the way of new species as does any other and larger province of the island,—and this, too, despite a denser population, a minimum of forest, a greater relative area under cultivation and an insignificant mountain system. So rich is this state in numbers of species, the many Cuban naturalists who have lived in or near Havana and three generations of visiting collectors who have ransacked the province, have not yet exhausted it of its treasures. Doctor Torre has quite a formidable collection of novelties from Madruga and its neighboring hills, and what is even more remarkable, a new sinistral Urocoptis from the golf-course of the country club scarcely more than without the city limits of Havana. Upon my return to Havana after roughing it in the wilds of remote Cuba I always detect a twinkle in Dr. Torre's eye as he matches my hard-won discover-

ies with equally interesting ones from, as it would seem, his very back yard.

The reason for all this is obvious. Havana province is all limestone and the mountain system that once occupied it and developed its rich fauna is now reduced to a number of isolated hills,—large, small and tiny, each standing alone and harboring a little faunula of its own of more or less modified species. One of the larger of these hills is in the northwest corner of the province (near Guanajay) and hardly an hour's ride by trolley from the city of Havana. It is about five hundred feet high, about a mile long, of limestone and well wooded. Its name is "Loma de Anafe,"—the word "loma" meaning *hill.* Barring a few dead shells gathered there recently and sent to Dr. Torre by a friend, I know of no mollusk records from it. Out of curiosity, and in a holiday spirit, I visited it last fall. The morning was given to the south side and the base; the afternoon to the top and to a deep gorge that fairly splits the hill on the north side,—called *La Barranca.* Within the deep gorge, with its precipitous walls and lush tropic vegetation and its generally wild aspect, it is hard to realize that the smoke of Havana is in sight above the eastern horizon.

The following list of land-shells from Anafe show a very typical Havana province assembage of names with just a suggestion of Pinar del Rio in the *Chondropoma ottonis.* Those with a "B" indicate the Barranca, or gorge, of the north side, while "S" indicates the south front:

Thysanophora boothiana Pfr. (S).
Thysanophora selenina Gld. (S).
Thysanophora saxicola Pfr. (S).
Thysanophora stigmatica Pfr. (B).
Pleurodonte (Thel.) auricoma Fer (S).
Cepolis (Jeann.) multistriata Desh (S, B).
Cepolis (Cyst.) cubensis Pfr. (S).
Liguus fasciatus Müll (western form of the Organ Mts. (S).
Urocoptis cyclostoma anafensis, n. subsp. (B).
Urocoptis poeyana Orb (S).
Microceramus perconicus anafensis, n. f. (S).

Oleacina o. straminea Desh. (S, B).
Oleacina solidula Pfr. (S, B).
Oleacina incisa Pfr. (B).
Rectoleacina suturalis Pfr. (S).
Varicella (Pich.) gracillima Pfr. (S)
Varicella (Pich.) acuticostata horrida Pils. (B).
Helicina adspersa Pfr. (S, B).
Emoda submarginata Gray (B).
Alcadia minima Pfr. (S).
Alcadia rotunda Orb. (var.) (B).
Eutrochatella sloanei Orb. (S, B).
Eutrochatella rupestris Pfr. (S).
Eutrochatella conica Pfr. (S, B).
Proserpina depressa Orb. (B).
Megalomastoma apertum Poey (B).
Chondropoma poeyanum Orb. (S).
Chondropoma (?) n. sp.? (B).
Chondropoma ottonis Pfr. (S, B).
Ctenopoma rugulosum Pfr. (S, B).
Ctenopoma nodulatum Poey (B).

Had I gathered some dirt in proper places several minute species could no doubt have been added.

The subspecies *anafensis* of *Urocoptis cyclostoma* differs from type only in the riblets. The number of these is about the same, but instead of "threadlike" they resemble little knife-blades projecting up from the whorl and with their sharp edges more or less bent forwards in the direction of the shell growth. They are oblique as in the type but describe a double curve from suture to suture.

The form *anafensis* of Pilsbry's *Microceramus perconicus* is smaller, with narrower, more convex whorls, and somewhat flatter base.

The *Chondropoma* left without a specific name is a puzzle. It belongs to the *poeyanum-pfeifferianum-pictum* complex with certain peculiar characters of each, the facies of all, but is not any one of the lot—or all of them. The reflected peristome is the trouble. I dare not name it.

NOTE ON THE MARGINELLA VARIA OF SOWERBY.

BY J. R. LE B. TOMLIN.

This species was originally described in the Proc. Zool. Soc. Lond. 1846, p. 97 (not p. 47 as stated by[1] Redfield) and figured the same year in the *Thesaurus* vol. I, p. 390, pl. 76, figs. 137–141. Sowerby gives the W. Indies and Belieze (*sic*) as localities, but there is no clue as to his types.

There can be no doubt, however, that, of his four figures, 138, 139 and 140 represent three color varieties of the ubiquitous West Indian *M. avena* Kiener (ex Valenciennes MS.), while fig. 141 as obviously depicts *M. albolineata* Orb. This has been generally recognized, as for example by Redfield, Jousseaume and Tryon.

The name *varia* Sow., has, however, for many years—probably on Carpenter's initiative—been[2] applied to a well-known Californian shell.

Tryon[3] indeed considers that this West Coast species is identical with *albolineata* Orb. from the West Indies, but I have no hesitation in rejecting this identification, and I do not think that it has ever found much evidence. The specimen which he figures is the true *albolineata* Orb.

I wondered at one time whether[4] *M. fasciata* Sow. could be the west-coast shell, but a careful study of the description and figure leads me unhesitatingly to endorse Tryon's surmise and to refer it to *M. mustelina* Angas. *M. fasciata* Sow. (*rubrifasciata* Jouss.[5]) was described from unknown locality on "specimens in the British Museum," but the types are no longer there and are presumably lost.

I propose, therefore, to give the name of *M. californica* to the Californian species which has so long passed as *varia* Sow.

The type specimen, which is in my own collection, may be

[1] Amer. Journ. Conch. VI, p. 244.

[2] Cf. Reep's West Coast Shells, p. 43.

[3] Manual, vol. V, p. 55, pl. 13, f. 37.

[4] Thesaurus, vol. I, p. 389, pl. 76, f. 142.

[5] Rev. et Mag. de Zool., 1875, p. 221.

briefly described as follows: Shell subcylindrical, smooth, vitreous and polished, yellowish white, variously banded with chestnut; spire short and completely glazed over; whorls 4½; aperture narrow, dilated, below; columella sinuous, obliquely truncate, with 4 fairly strong oblique plaits; outer lip thickened without; suture marked by a narrow white line.

Length 9 mm.; diam. max. 4.5 mm.; length of aperture 7 mm. I have selected as type the form with 3 broad chestnut bands on body whorl—the uppermost band being rather narrower than the other two—as this corresponds most nearly with the usual coloration of *Marg. albolineata* Orb.

M. varia Sow., quoted by Deshayes from Réunion, must of course have been a misidentification. According to von Martens it was in reality *M. lienardi* Jouss., but I should be inclined to suggest *M. sordida* Reeve. In Reeve's description of this last "triplicata" is an error for "quadriplicata," judging from the presumable type in the Brit. Mus.

ON SOME ILL-UNDERSTOOD OREOHELICES.

BY HENRY A. PILSBRY.

OREOHELIX HAYDENI UTAHENSIS (Hemphill).

This form has a somewhat complicated history. The first notice is contained in a letter from Mr. Henry Hemphill, quoted by Mr. Binney in "A Second Supplement to the fifth volume of the Terrestrial Air-breathing Mollusks of the United States," Bull. Mus. Comp. Zool. XIII, No. 2, p. 30 (Dec., 1886). The account reads:

"I then returned to Salt Lake City, and crossed the valley to the west, camping on the west side of a range called the Oquirrh Mountains. Here commenced a series of finds that was quite exciting and very interesting to me. At the foot of the mountain my attention was attracted to a pile of detached rock, usually a good place for snails. After a few moments' work among these stones I was rewarded by finding quite a number

[1] Conchyl. de l'Ile de Réunion, p. 136.

[2] Beiträge zur Meeresfauna....Mauritius, p. 258.

of specimens of the variety I call *Utahensis.* (See p. 33.) This has the form of *Hemphilli*, but is destitute of the revolving ridges of *Haydeni.* The specimens were all constant in sculpturing, but varied very much in size and somewhat in form."

According to labels sent out with specimens at the time, Mr. Hemphill considered *utahensis* to be a variety of *hemphilli* Nc., but this does not appear in the printed account.

On page 33 of the same work (Second Supplement to Vol. V, T. M.), Binney gives the following account :

"Var. UTAHENSIS, Hemphill.

"For locality, see *ante* p. 30. This is a rough, coarse, carinated *strigosa*, figured in Terr. Moll., V, p. 158, fig. 66. The peristome is sometimes continuous by a heavy raised callus, connecting its terminations. It is sometimes smaller and more elevated."

It appears from both of these extracts that the *type locality* of var. *utahensis* is the Oquirrh Mountains, in Utah, west of Salt Lake City. The diagnosis of the form given in Hemphill's letter leaves much to be desired. Even with the type locality, the form could hardly be recognized with certainty without specimens from the author. Yet in the absence of any competing name for the same form, we may accept Hemphill's notes as a description, since they are accurate as far as they go.

Binney, while reiterating Hemphill's locality, introduced confusion by referring to fig. 66 of Terr. Moll. V (same cut was reprinted as fig. 154, in Man. Amer. Land Shells), and adding characters from the shell that cut represents. This fig. 66 was originally published in Land and Fresh-Water Shells of N. A., part I, p. 78, figs. 135, 137, with the note, "It is sometimes strongly carinated, and the peristome is sometimes made continuous by the heavy, raised callus connecting its extremities." At this time (1869) no shells were known from the Oquirrh Mountains. The figures in question were drawn from a shell from the Big Horn Mts., in northern central Wyoming, collected by the geologist F. V. Hayden. This shell was collected in quantity, and there are specimens from the same source (and also received through Binney) in the collections of the Academy of Natural Sciences, the National Museum, and the American

Museum of Natural History. While resembling the smoothest examples of var. *utahensis*, this shell from the Big Horn Mountains is certainly a distinct species from the Oquirrh shell. It is the species to be described below as *Oreohelix strigosa magnicornu.*

Var. *utahensis* Hemph. should stand, I believe, as *O. haydeni utahensis.* It has very much the shape of *O. hemphilli*, but differs by the *much less convex* whorls of the embryonic shell. It is typically without spiral sculpture on the last whorl, but some of Hemphill's specimens show widely spaced spiral beaded lines, making a transition to var. *gabbiana* Hemph. A typical specimen, without spirals on the last whorl, measures, alt. 10, diam. 16.5 mm. (No. 23051 A. N. S. P. collected by Hemphill).

On account of the variability of the Oquirrh shells, I have some doubt whether, with larger collections, it will be possible to recognize more than one subspecies of *O. haydeni* in that range, in which case I would select the name *O. h. oquirrhensis* to cover all. Mr. Hemphill recognized in the Oquirrh varieties *utahensis*, *oquirrhensis*, and *gabbiana*, also "typical *haydeni*," and on his labels he called some *H. hemphilli.* Until we have adequate collections it may be possible to define three races in the Oquirrh range, but certainly not five.

The synonymy of *Oreohelix haydeni utahensis* will stand thus : [*Patula strigosa* var.] *Utahensis* Hemphill, in Binney, Second Suppl. Terr. Moll. V., p. 30.

[*Patula strigosa*] var. *Utahensis* Hemphill Binney, t. c., p. 33 (locality, but not figure cited or description given) ; see Man. Conch. viii, p. 118, pl. 42, figs. 10, 11.

Binney's paragraph under "*Patula strigosa*, var. *Utahensis*, Hemphill" in the fourth Supplement, 1892, p. 173, is largely a repetition, and excepting for his reference to the Second Supplement, it belongs to *O. s. magnicornu.*

Oreohelix strigosa magnicornu, n. subsp.

The shell is solid, the first $3\frac{1}{2}$ whorls but slightly convex, pale brown with a faint darker spiral band (or none), the later whorls nearly white (the shell being more or less bleached).

Last whorl carinate in front, the carina weakening to an angle on the last $\frac{2}{3}$ whorl, very weak near the outer lip; deeply descending in front. Sculpture of fine, low growth-lines on the early whorls, the last $1\frac{1}{2}$ having coarse, irregular but low growth-lines. Aperture shortly oval, the peristome continuous as a short, raised ledge across the parietal wall.

Alt. 11, diam. 18 mm.; width of umbilicus 3.5 mm.

Big Horn Canyon, Big Horn Mts., Wyoming. Type and cotypes no. 1907 A. N. S. P., from the A. D. Brown collection.

Three lots of this species have been in the collection for many years, one of them collected by F. V. Hayden, the others probably from the same source, though the labels do not state the collector. They are certainly distinct from any of the named subspecies and forms.

Although now fully described for the first time, this form has been figured and noticed in several publications. The synonymy will stand thus :

Helix cooperi W. G. Binney, Land and Fresh-water Shells of N. A., I, 1869, p. 78, figs. 135, 137.

Patula cooperi W. G. B., Terr. Moll. Vol. V, 1878, p. 158, fig. 66.

Patula strigosa Gould, W. G. B., Man. Amer. Land Shells, 1885, p. 166, fig. 154.

[*Patula strigosa*] Var. *Utahensis* Hemphill, W. G. Binney, Second Suppl. Terr. Moll. Vol. V, 1886, p. 33 (exclusive of reference to p. 30).

Patula strigosa var. *Utahensis* Hemphill, W. G. Binney, Fourth Suppl. T. M. Vol. V, 1892, p. 173 (exclusive of reference to Second Suppl., p. 30).

These references all contain substantially the same descriptive matter, and the same figures. Both originated in the wo k of 1869, and were afterwards reprinted with a change of the specific name.

Oreohelix cooperi (W. G. B.)

It may be noted that the basal views in figs. 152 and 153, on page 166 of Manual Amer. Land Shells, were tranposed. The umbilical view of *O. cooperi*, fig. 152, was placed under fig. 153, which is a form of *O. strigosa depressa*, and vice versa. The same mistake appeared in Terr. Moll. V, p. 158, figs. 64, 65.

NOTES.

EDIBILITY OF POLYGYRA AND ARIOLIMAX.—A native New-Englander told me that he and others ate *Polygyra albolabris* (Say) at Plymouth, Massachusetts. He likened the taste to lobster.

I have learned of *Ariolimax columbianus* (Gld.) being eaten in Polk County, Oregon, by a German, and in Clark County, Washington, by a family from Artois in France. The latter washed these slugs in water containing vinegar to remove the slime, which they said was bitter, then cleaned them like fish, and fried them in butter. They found the flavor good.

Snakes eat *Ariolimax columbianus*. Large, conspicuous and often very abundant, it must need some protection from birds. This is probably afforded by its copious and sticky slime. Domestic ducks attack this slug; but the slime inconveniences them and is said sometimes to cause their death by accumulating in their bills.—JOHN A. ALLEN, Manzanita, Oregon.

FLORIDA SHELLS.—Mr. Morgan Hebard collected a small quantity of leaf-mould at Brickell's Hammock, Miami, Florida, on March 2 and 4, 1916, from which I picked *Euconulus sterkii* Dall. This is an addition to the list of Miami shells published by Mr. S. N. Rhoads in the NAUTILUS, xiii, p. 43 (1899).

The following species were picked from the leaf-mould which Mr. Hebard collected on February 29 and March 2, 1916, at Snapper Creek, about 15 miles south of Cocoanut Grove, Dade County, Florida:

Helicina orbiculata Say.
Thysanophora selenina Gld.
Thysanophora plagioptycha Shutt.
Thysanophora diosocricola Ad.
Praticolella jejuna Say.
Drymæus dominicus Rve.
Bifidaria contracta Say.
Vertigo milium Gld.
Opeas micra Orb.
Varicella gracillima floridana Pils.
Polita dalliana "Simps." Pils.
Polita indentata Say.
Euconulus sterkii Dall.
Guppya gundlachi Pfr. (The typical form.)
Zonitoides arborea Say.
Zonitoides minuscula Binn.
Zonitoides singleyana Pils.
Carychium exiguum Say.

All these shells are in the collection of the Academy of Natural Sciences of Philadelphia.—E. G. VANATTA.

The table of Winnecook, Montana, Mollusca, which was offered in my paper in the March *Nautilus* (p. 125), suffered editorial deletion of two of its original columns of data.[1] From the list as printed it would appear that my subsequent note on the coincident occurrence of *Succinea oregonensis* and *S. avara* was based on the discovery of but a single specimen of each. It should be stated that in 1913 both species were found living together in some numbers. The specimens differed with absolute uniformity in both animal and shell and there were no intergrades.

On p. 127 occurs a *lapsus calami* of my own: July 4, *1915* is the correct date for the collection in Swimming Woman Creek Canyon.—S. S. BERRY.

CYPRAEA VENUSTA var. BAKERI, Western Australia, and C. MILIARIS var. GABRIELI, Northern Territory, Australia, are new cowries described and figured by Mr. J. H. Gatliff, in The Victorian Naturalist for February, pp. 147-149.

Mr. Frank C. Baker, Zoological Investigator for the New York State College of Forestry at Syracuse University, addressed the Syracuse Chapter of the Society of Sigma Xi on February 25; his subject was "The Relation of Mollusks to Fish in Oneida Lake." The address embodied an outline of the biological survey carried on during the fall of 1915 by Doctor C. C. Adams, Professor T. L. Hankinson and Mr. Baker, the object sought being to ascertain the fitness of this largest of New York's inland lakes for the maintenance of fish fauna. At this meeting of the Society, Mr. Baker was installed as an active member of the Syracuse Chapter of Sigma Xi.

[1] The two columns deleted merely recorded the species taken in two years preceding those in the printed record, without indication as to abundance, association or any other data. As all appeared also in the subsequent records the Editors failed to see their importance.

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